The American Journal of Surgery

NEW SERIES, VOL. VIII MAY, 1930 No. 5

PYOGENIC AND NON-PYOGENIC KIDNEY INFECTION

FROM A PATHOLOGICAL STANDPOINT*

CHARLES Y. BIDGOOD, M.D., F.A.C.S.

HARTFORD, CONN.

IT IS not an uncommon experience in the practice of urology to encounter such a case as the following, which is presented in brief summary in order to illustrate one finding:

CASE I. C. R., admitted to the Hartford Hospital June 13, 1927, on the service of Dr. G. Gardiner Russell, temperature 100.8°F. Complaint: pain in the right side. Examination revealed an enlarged, tender right kidney. The voided urine contained a moderate amount of pus. Cystoscopic examination revealed a normal bladder. Ureter catheterization demonstrated no obstruction. Phenolsulphonephthalein given intravenously showed appearance time, right kidney, three minutes; left kidney, three minutes; secretion, right side 9 per cent, left side 11 per cent, in thirty minutes. Urine obtained from each kidney was sterile to culture. A few days later a large perinephritic abscess was evacuated by Dr. A. M. Rowley. Culture of the pus showed Staphylococcus aureus.

The point to be demonstrated in this case is that sterile urine may be secreted by a kidney which is the site of a staphylococcus infection of sufficient intensity and duration to result in a perirenal abscess.

In contrast to this, is the common finding of chronic infections of the kidney and pelvis caused by organisms of the colon-typhoid group without severe damage to the kidney or great harm to the patient, and it is the purpose of this report to demonstrate the pathological condition which may ultimately result from an untreated colon infection of the kidney with continuous good drainage of the pelvis, in comparison with the end result seen in the above case, a coccus infection, in similar circumstances.

CASE II. Mrs. R. L., age forty-two, was admitted to the Manchester Memorial Hospital December 3, 1928, complaining of pain in the left back.

Present Illness. Onset six months before admission to the hospital. At that time the patient first noticed a dull, dragging pain in the left side, most noticeable at the end of an active day. This pain was located in the left back and side and radiated downward towards the groin and leg. It has never been acute and she has had no attacks simulating kidney colic. Four months before admission to the hospital she began having an occasional slight chill, followed by profuse sweating which would cease after a few hours. She thinks that she has been having a slight fever in the afternoon and evening during this time, because she has felt warm and her skin has been flushed. For the past three months it has been necessary for her to get up at night to void three or four times, and during the day she has voided about every hour and a half. There has been no dysuria, no hematuria, no urgency. During the past month her pain has become more constant and more severe. It has been located definitely over the left lumbar region, and the patient has noticed on palpating her side that a mass was present there.

* Read before the New York section of the American Urological Association, November 27, 1929.

Past History. Except for the present illness the patient has been a normal, healthy woman. A review of the eye, ear, nose and throat, cardiorespiratory, gastrointestinal and nervous systems is negative; also the urinary tract up until the present illness.

FIG. 1.

Personal History. The patient has had ten children, all normal labors. Nine are living and well, one died in infancy. No miscarriages. Menstrual history: periods have always been regular and normal, no bleeding between periods. Family history negative for tuberculosis, cancer, etc.

Physical Examination. The patient is a well developed, well nourished, adult female, forty-two years old, lying quietly in bed, apparently in no pain. Temperature 99°F., pulse 85, respiration 20, hemoglobin 95 per cent, red blood corpuscles, 4,400,000.

Examination of the eyes, ears, nose, mouth, throat normal; thorax and lungs normal; cardiovascular: heart not enlarged, apex beat is in the fifth interspace within the nipple line. Pulse 80, regular, good quality. Blood pressure 130/70. Extremities normal, reflexes normal.

Abdomen. The abdomen is slightly pendulous and there are numerous striae. On inspection, respiratory movements are found equal and normal on each side. On palpation no epigastric tenderness is found, no masses. No tenderness, masses or muscle spasm felt in the right flank or costo-vertebral angle. No suprapubic tenderness, bladder not distended. In the left flank and costovertebral angle a large mass is felt. This is found to be well up underneath the ribs and to extend almost to the mid-line anteriorly and downward as far as the crest of the ileum. It is slightly irregular on palpation; it does not fluctuate; it descends on inspiration; it is moderately tender, and there is definite muscle spasm in the costovertebral angle. Catheterized urine shows a large amount of pus and a stain smear shows many Gram negative bacilli. The specific gravity is 1020; reaction acid, sugar and diacetic acid, negative.

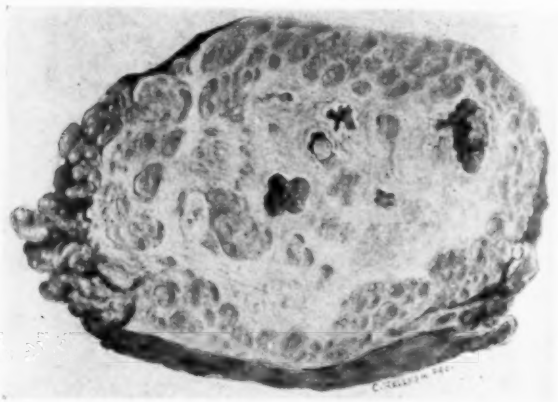


FIG. 2.

Cystoscopy. The cystoscope enters readily and shows cloudy urine in the bladder. Bladder capacity 450 c.c. On inspection the entire bladder mucosa shows a diffuse catarrhal inflammation. No ulcers, tumors, stones seen. No diverticula. The trigone is slightly reddened and granular. Both ureteral orifices are normal in size and contour, but the left orifice is reddened and there is seen coming from it long shreds of inspissated pus. Clear urine is being secreted from the right side. No. 6 catheters ascend to each kidney without meeting any obstruction, and clear urine is obtained from the right side, and very purulent urine from the left. Intravenous phenolsulphon phthalein shows the appearance time on the right side five minutes; secretion 25 per cent, in thirty minutes. On the left side no phenolsulphon phthalein appeared in thirty minutes.

Microscopic examination of the urine obtained from each kidney shows the urine from the right kidney to be free from pus, and a stain smear showed no organisms. On the left side the urine contained a large amount of pus, and a stain smear showed many colon bacilli. Culture of the urine for twenty-four hours showed the right side to be sterile and the left side to contain many colon bacilli.

X-ray Report (Dr. D. J. Roberts, Roentgenologist):

The stereoscopic *x*-ray examination of the urinary tract before and after the injection of each kidney pelvis shows the right kidney outline to be somewhat enlarged, with normally filled pelvis, calices and ureters. The left kidney outline is not well defined. Throughout the region of the lower calices on the left side there are poorly defined semi-opacities suggesting debris or calcareous changes in the kidney substance. Following injection of this side the kidney shows a marked deformity and disintegration, the general appearance suggesting multiple abscess formations, the major and minor pelves appearing considerably contracted. The ureter, while it is slightly enlarged throughout its lower two-thirds, is otherwise negative in appearance.

Roentgen Conclusions. Marked disintegration of the left kidney cortex with contractures of the major and minor calices, and calcareous deposits in the kidney substance (the general appearance compatible with advanced tuberculous changes).

Final Diagnosis. Chronic colon bacillus infection of the left kidney, with a functionless kidney.

Operation. The patient was placed in the usual kidney position and an incision made beginning at the costovertebral angle and extending downward and anteriorly to a point opposite the anterior superior spine of the ileum. The external and internal oblique muscles and transversalis were divided and the perirenal fascia exposed. This was opened and the perirenal fat exposed. Digital examination failed to reveal any line of cleavage between the perirenal fat and kidney, the entire kidney having been completely destroyed and replaced by scar tissue. It was therefore necessary to remove the perirenal fat with the mass. This was done, all fibrous bands being doubly clamped, divided and ligated.

The tissues at the upper and lower pole were similarly treated until the entire mass, including the perirenal fat, was free. The ureter was isolated below the mass, doubly clamped, divided and ligated. The pedicle was triply clamped, divided and doubly ligated. In so doing a small vessel of the pedicle was made to bleed slightly, but was quickly caught and ligated. Two rubber tissue drains were inserted into the depth of the wound and the muscle layers closed with a mattress suture of No. 2 chromic catgut. The skin was closed with fine silk.

The patient's condition at the end of operation was entirely satisfactory.

Following operation the patient had an uneventful convalescence and was discharged from the hospital three weeks later with the wound completely healed, and the urine free from infection.

Pathological Report of Specimen Removed (Dr. Ralph Kendall, Pathologist):

Macroscopic examination: The specimen consists of an oval fibro-fatty mass, weight 858 gm., measuring $15 \times 9 \times 8$ cm. At one side a tube-like structure is seen which has the appearance of a thickened ureter. On section the bulk of tissue shows ordinary fat lobules separated by increase in fibrous tissue. At the center of the mass there is more dense gray white fibrous tissue, not sharply outlined, but roughly kidney-shaped, and through which are seen small cavities filled with white purulent material. The ureter can be traced into one of these cystic areas before it reaches this space. However, it passed through a dense, rather fibro-fatty tissue.

Microscopic Examination: The renal parenchyma is completely destroyed and replaced by a dense and cellular fibrous tissue through which occasionally are seen a few distorted tubules or rare glomerulus. The latter shows a marked dilatation of the capsular space. Throughout the entire tissue there is a marked round and plasma-celled infiltration frequently arranged as lymphoid follicles. Beneath the epithelium of the pelvis there is a massive round-celled and polymorphonuclear cell reaction. There is no evidence of tuberculosis. At the outer margin, the capsule of the kidney cannot be identified from the marked fibrosis of the parenchyma. There is, however, a thick layer of fatty tissue at the surface.

DISCUSSION

When any parenchymatous organ is invaded by bacteria, the resulting patho-

logical process is determined by a combination of circumstances: the dosage and virulence of the organism, the degree of immunity of the host, and the efficiency of drainage. The first two of these are considerations in any infection; but the last, drainage, is of particular importance, because by it, more than any other local factor, is the ultimate life or death of the organ determined.

When one speaks of drainage in kidney infections, the usual conception conveyed is drainage of the kidney pelvis. But it is believed by several investigators, such as Dyke, that drainage within the kidney parenchyma, particularly at the inception of the infection, is the basis upon which rests the correct explanation of the fact that different types of organisms, notably those of the colon typhoid group, and the pyogenic cocci, often yield dissimilar pathological processes.

To be more explicit, there is an opinion among investigators that organisms belong to the colon typhoid group show a predilection for that portion of the kidney which has its origin in the Metanephros, namely the ureter, pelvis and collecting tubules, that portion of the secretory mechanism which is efferent to the glomerulus; while the cocci, according to the experiments of Dyke, are disposed to lodge as emboli in the vessels afferent to the glomerulus. If this theory be acceptable, it would follow that in the latter location there would be no opportunity for drainage into the renal pelvis, the glomerulus serving as a barrier, and for lack of this drainage, abscesses would result, located chiefly in the cortex and boundary zone of the kidney. This, we know, is the clinical picture frequently seen in staphylococcus infections. It is conceivable that such lesions might heal spontaneously; but it is more often true that once inaugurated, the infection will progress, ultimately terminating in a kidney studded with multiple confluent abscesses. If the lesion is confined to only a part of the kidney, to a localized area of miliary abscesses, the so-called "carbuncle of the kidney" results. If the abscesses rupture into the pelvis of the kidney and there is interference with pelvic drainage, pyonephrosis will result, and if the rupture occurs through the cortex, a perinephritic abscess.

With infections due to the bacteria of the colon-typhoid group, the pathological picture is different from that described here. This group of organisms never results in multiple disseminated abscesses of the kidney parenchyma, perinephritic abscess, or "carbuncle of the kidney," because, being efferent to the glomerulus, drainage is allowed.

The likelihood that the above hypothesis may be true has considerable support clinically. With regard to coccus infections, it is the not common experience of all urologists to encounter suppurative lesions of the kidney with multiple parenchymatous and perinephritic abscesses, usually staphylococcus in origin, with sterile urine being secreted by the infected kidney. This would indicate that the site of the infection is such that it cannot drain into the kidney pelvis, and since it is reasonable to assume that if the infection were efferent at the glomerulus, at least some drainage would occur, it follows that the infection must be afferent to it, and that the glomerulus forms a barrier to drainage. Experimentally, the recent work of MacKenzie and Hawthorne shows that intravenous injections of colloidal particles in sufficient dosage, causes blocking of the capillaries of the glomeruli, and the intertubular capillaries which, if permanent, ultimately causes infarct formation.

In contradistinction to this is the common experience that in the majority of simple, acute and chronic infections of the kidney due to organisms of the colon-typhoid group, recovery is the rule without serious renal damage, if there is efficient pelvic drainage, probably because the infection attacks primarily that portion of the kidney efferent to the glomerulus.

This difference is also supported by statistics. Cabot and Crabtree's analysis

of a series of kidney infections reveal focal suppurative lesions to be the rule in 27 cases of coccus infections, with cortical abscess in 20 of them. In their studies of lesions produced by the colon-typhoid group, they found no cases presenting the same condition when pelvic drainage was good, and their studies of sections stained for bacteria showed the presence of bacilli in the collecting tubules to be the rule. In their conclusion they say: "we believe that lesions produced by cocci and pyogenic bacilli differ essentially from the lesions produced by the non-suppurative organisms, chiefly the colon-typhoid group."

CONCLUSIONS

The theory presented here is not original in this paper, but is based largely upon the experimental work of Dyke, and is used as a working basis for the explanation of clinical differences often seen in coccus and bacillary infections of the kidney.

The case demonstrated represents an instance of autonephrectomy caused by an untreated colon bacillus infection. It is presented because we believe that it typifies the final pathological picture which may result if such infections are allowed to progress without therapeutic interference.

[For discussion see p. 964.]

REFERENCES

Dyke, S. C. *J. Path. & Bact.*, 26: 164, 1923.
Brewer, G. E. *Surg. Gynec. Obst.*, 2: 485, 1906.
Cabot, H., and Crabtree, E. G. *Surg. Gynec. Obst.*, 23: 495. 1916.

SURGERY OF THE FIBROUS PROSTATE

AN OPERATION FOR TOTAL EXCISION OF THE GLAND*

E. GRANVILLE CRABTREE, M.D., F.A.C.S.

BOSTON, MASS.

THE trend in urological surgery seems to me to be definitely away from uniformity in operative measures to be applied to obstructing lesions of the prostate gland. Many surgeons aim to approach the prostate by that operative procedure best adapted to the type of gland encountered. There seems to be an increasing number of surgeons employing both the suprapubic and the perineal approaches for prostatectomy. Early advocates of the suprapubic operation often held themselves purists, and did not ever depart from their conviction as to the superiority of the suprapubic route. Cancers, fibrous contractures, and large adenomata received similar treatment at their hands. Perineal operators lived up to their ideals with equal fervor and dragged large benign intravesical prostrates through the perineum. Perusal of the literature on prostatic surgery of an earlier day indicates combative exposition of one method of approach to the exclusion of the other. In spite of this combative attitude both operations have survived on their merits. The fact remains that the great majority of obstructive prostates are operable with low morbidity and mortality by either method of approach.

A few years ago, on reviewing the end-results of operations for fibrous prostates in my own cases and those of other surgeons which happened to pass through my hands, I found a higher morbidity than average in patients suffering from fibrous glands. The type of lesions encountered were roughened prostatic cavities, tight internal sphincters, urethras contracted through the prostatic bed, an occasional non-catheterizable patient, and others with continued symptoms in spite of operation, and persistent infection. A few of these patients had been operated on more than once in the hope of improving the end-result. The group of patients represented the combined efforts of eight surgeons. It was easy to see that the fibrous prostate offered by no means so good a prognosis as benign hypertrophy. It was with the hope of producing better results that I began to do total prostatectomy on this type of case. It is my purpose to submit in this communication the end-results of a group of 15 cases operated upon in this manner. It was my intention to do an occasional case by this method until sufficient time had elapsed to determine the value of the surgical measure before adopting it as routine.

In discussing total excision of the fibrous prostate, I do wish to discredit in any way the cautery operations devised by Caulk, Collings and others for prostatic bars. The work of these pioneers in this type of work is most praiseworthy. I believe such electrocautery procedure should be encouraged in every case to which the operation is applicable. However, since in many fibrous prostates a bar does not constitute the whole of the obstruction, but a shrunken atrophic gland is itself capable of offering resistance to voiding; since intraurethral impingement of small nodules of hypertrophy from lateral lobes often exist together with bar formation; since fibrosis may exist without bar formation; and dilatation of the atrophic fibrosed gland is an unsatisfactory means of maintaining free drainage in an old man who wants cure of his condition, a group of cases suitable for a more radical treatment than the cautery is constituted. It is with this group that I have concerned myself in performing total removal of the prostate gland.

* Read before the American Urological Association (N. Y. Branch), November 27, 1929.

I had for some time been employing total prostatectomy by the perineal route in suitable cases of carcinoma of the

Fig. 1. Central tendon and rectourethralis muscle divided; membranous urethra exposed. Transverse incision into urethra at apex of prostate upon sound. Prostate tractor ready for insertion.

prostate and those suspected of carcinoma, because I felt that it gave me an opportunity to do a more extensive operation

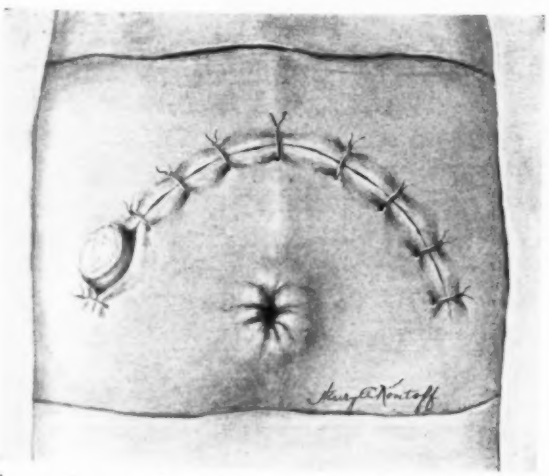
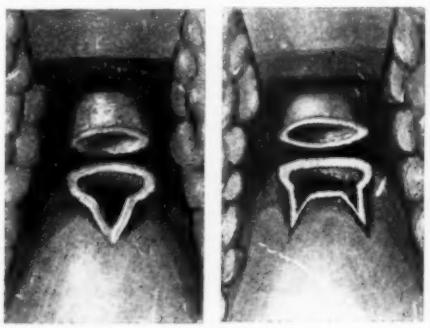


Fig. 2. Suture of perineal wound and drain in place.

and still leave the patient with less damage as a result as shown in incontinence or damaged function. I had also performed a certain number of suprapubic dissections of fibrous glands. I do not believe these have been nearly so satis-

Fig. 3. Sagittal view after removal of prostate. Soft rubber catheter in urethra and drain in place.

factory as those operated on by the method of total prostatectomy which I shall later describe in detail. In transvesical dissections I found that I was not obtaining as smooth a cavity and was apt to find portions of prostate left near the membranous urethra, that is, the tip of the prostate and at the bladder neck. These irregularities gave obstruction, perhaps not greatly noticeable immediately



A B

Fig. 4. Midline incision in posterior neck of bladder so that when sutured to urethra, floor of bladder is on line with urethra and there is no sagging of trigone.

after the operation but occasioning considerable trouble some months later. In addition I have found that suprapubic operations for the fibrous glands are, in my hands, not nearly so easy technically as the operation through the perineum. I

therefore abandoned the suprapubic approach in favor of the perineal operation.

In preliminary preparation of these patients drainage was accomplished by the urethra in some, by suprapubic cystotomy in others, and in a third group by combined urethral and suprapubic drainage. In making the choice of drainage to which the patient was subjected, the urethral type was used in those patients in whom a short period of drainage preparation was all that was required. The majority of the patients preferably had suprapubic drainage by cystotomy. It is my impression that by suprapubic drainage prostatic congestion is diminished, the patient bleeds less at operation, and on the whole the bladder is in better condition at the time of the subsequent operation on the prostate. Where calculi are present suprapubic drainage is of course preferable to urethral drainage. In still a third group of cases, particularly those in which diverticulum was encountered as a complication to the fibrous prostate obstruction, combined urethral and suprapubic drainage was employed. Greater ease in handling the bladder pathology through a primary wound was the basis for decision in favor of urethral drainage previous to the operation for diverticulum. At the time of operation for diverticulum a suprapubic drain was placed, and the patient allowed to continue on that drainage until the perineal operation was completed. In a few cases urethral drainage was not well tolerated and suprapubic drainage was established immediately.

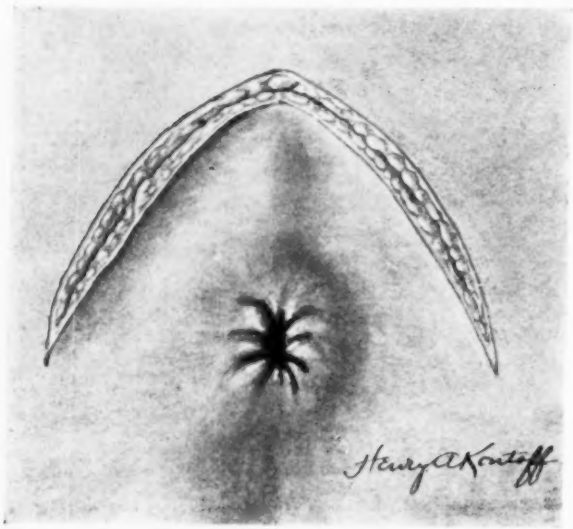


FIG. 5. Perineal incision used for prostatectomy.

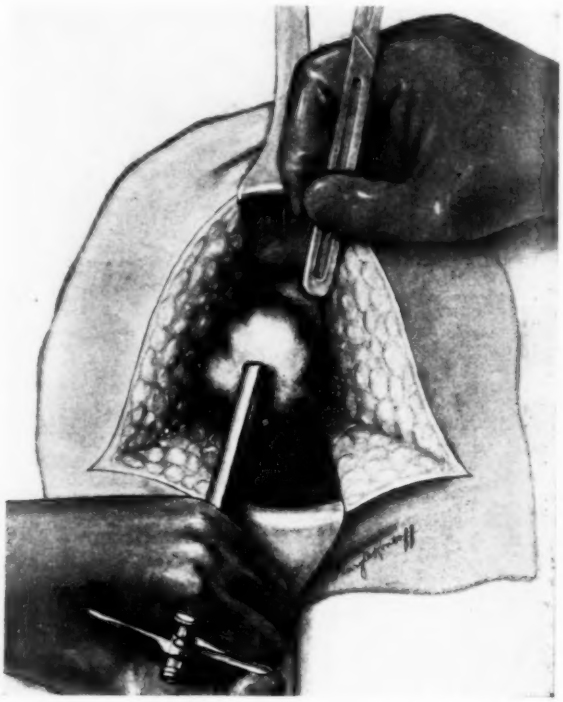


FIG. 6. Tractor opened out and prostate drawn down. Prostate, en masse, being dissected free from surrounding tissue by handle of knife.

Bilateral vasoligation was done in all cases as a preliminary to prostatic operation. While vasoligation is not a 100 per cent guarantee against testicle complications in prostatic obstruction, it so diminishes the morbidity from this disease that it is well worth while. I have been unable to detect any systemic change in the patient as the result of this procedure. Except by reference to the patient's history, I do not believe I can distinguish between those patients in whom vasoligation has been done and those in whom it was not a part of the prostatic operation. The time at which vasoligation is done is at the institution of drainage in those cases in which urethral drainage is employed, and at the time of suprapubic

cystotomy in those instances where suprapubic drainage is used. In those patients in whom the period of urethral drainage was short, ligation of the vas was sometimes done at the time of the prostatic operation. In others where diverticulum complicated the operation for prostatic obstruction ligation of the vas was done at the time of the operation for diverticulum. Vasoligation has proved to be a boon to the prostatic patient and a source of great comfort to the surgeon, and I have no doubt, has saved the lives of a few cases that were narrowly balanced and in which a severe degree of epididymitis has seemed to be the deciding factor which finally caused the loss of the patient's life.

DESCRIPTION OF THE OPERATION EMPLOYED

With the patient in the lithotomy position, an inverted U perineal incision was made and carried down to expose the central tendon of the perineum. The tendon was severed and the prostate exposed freely by reflecting the posterior layer of the membrane of Denonvilliers. Transverse section of the membranous urethra at the tip of the prostate was then made on a sound in the urethra, and Young's perineal retractor inserted into the bladder. At this point complete section of the membranous urethra can be made. By means of blunt dissection and sharp dissection wherever necessary the gland is readily exposed upon the bladder wall. By slightly increasing the traction on the perineal tractor the prostatic urethra can be opened at the internal orifice on the retractor as a guide. A smooth internal orifice can be provided with curved operating scissors by dissecting away the prostate from the bladder wall. Tenaculum forceps are then inserted into the internal prostatic orifice and the gland turned outward after the perineal tractor has been removed. By gentle traction and blunt dissection the gland can be sufficiently elevated to allow separation of the ejaculatory ducts with curved scissors. All bleeding points can be snapped and tied at this point to insure a dry wound. Inasmuch as the fibrous gland is a small

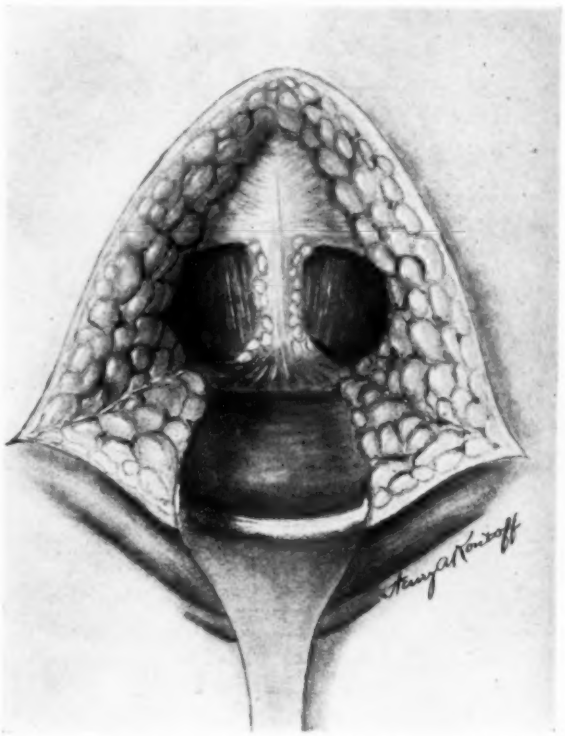


Fig. 7. Space opened on each side of central tendon by fingers.

gland, the distance separating the bladder neck from the severed urethra is never great, and sufficient slack is obtained by traction on the bladder to easily approximate the bladder neck and the severed urethra. A large urethral catheter, as large as the urethra will permit, is then passed into the bladder and the bladder neck sutured to the urethra over this catheter. This forms a complete mucous membrane connection between the severed urethra and the bladder. If care is taken, sufficient prostatic urethra can be left to allow of the resuturing being done without greatly altering the position of the internal vesicle sphincter. A small perineal drain, usually of rubber dam or Miller wicking, or a light gauze pack can be placed, and the wound closed without further drainage. It has been my experience that with an open wound and the opportunity to ligate all bleeding points a rubber dam drain is

used much more effectively than the gauze pack. Bleeding has in no case been excessive and seldom has there been more than a slight discharge of serous fluid. Rarely is there any leakage of urine through the perineum. Where the bladder base is not flattened by removal of the prostate, two procedures have been employed to accomplish this aim. The first of these is as follows:

Fig. 8. Anastomosis of neck of bladder with stump of membranous urethra with interrupted chromic catgut.

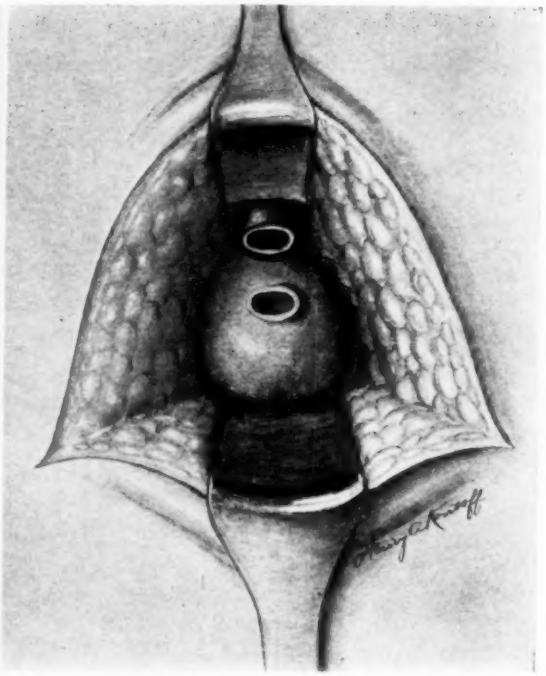


Fig. 9. Prostate removed, showing opening at neck of bladder and cut end of membranous urethra.

A v-shaped excision is made in the posterior lip of the bladder orifice in such a way as to lower the posterior margin of the bladder orifice to the level of the bladder floor. (See Fig. 4A.) As near an approximation as is possible is then made so that the severed urethra may close this opening. Such enlargement of the bladder neck is usually too great for the urethra to close it entirely. These patients may leak some urine through the perineum in the course of convalescence. In the other procedure, two lateral incisions are made to produce a lip on the posterior surface of the internal orifice, which lip is sutured to the severed end of the urethra. (See Fig. 4B.) The nature of these two supplementary incisions will be best seen by reference to the illustration. As will be noted by reference to the tables on end-results in these cases, there is no evidence that such enlargement of the internal sphincter increases the tendency to incontinence or decreases the function of the bladder. I am convinced that flattening of the bladder base is an important procedure particularly in those cases of contracture in which the internal orifice of the bladder is greatly elevated above the position of the ureters in the bladder. As has been already mentioned this is not always a necessary procedure for most often, removal of the prostate sufficiently flattens the bladder base to make such an incision unnecessary. As one might expect in those cases in which gauze packing of perineal wounds, or insertion of bags for hemastatic control is not indicated, the patient's convalescence is extremely comfortable, drainage and sutures are removed within a few days, and the perineal incision heals by first intention. Where suprapubic drainage has been employed it is usually removed at the time of operation, but the

Table 1

Date	Age	Cystot.	Cath.	Other Path.	Drainage Days	Post Op. Return of Func.	Condition in 1929				
							Living	Pus in Urine	Satisfactory Function	Resid. Urine	
1924	58	×			12	14 days	×	0	×	0	
1924	73	×			19	20	×	0	×	0	
1925	53	×		Diverticulum	64	3	×	×	×	0	Expelled cath. 3rd day postop. voided.
1925	59	×			22	20	×	0	×	0	
1925	68	×			10	21	×	0	×	0	
1926	71	×		Stone	7	30	×	0	×	0	Emphysematons lungs—cardiac.
1926	72	×		Stone	29	?	×	0	×	0	Accurate data for return of function not recorded.
1926	66		×		14	16	×	0	×	0	
1927	58		×		13	14	×	0	×	0	
1928	69		×	Diverticulum	13	9	0	..	..	..	Emphysema. Returned to hosp. and died. Pneumonia.
1928	54	×			9	9	×	0	×	0	
1928	79	×			57	11	×	0	×	2 oz.	Extensive fibrosic bladder wall.
1928	55		×		31	12	×	×	×	0	
*1929	69		×	Small stones	10	10	×	0	×	0	
*1929	68		×		18	9	×	0	0	0	Dripped for 4 months. (Slight.)

Average 14 days

* Six months post op.

suprapubic tube can be left indefinitely. I have made no provision for retaining the urethral catheter other than the usual adhesive tape fixtures applied to the penis for this purpose. Since bleeding from the prostatic cavity is not apt to enter the bladder because of the suture line which excludes it, drainage from the bladder is usually clear from the beginning and gives no trouble whatever. I do not know the fate of the vesicles where the ejaculatory ducts have been severed, but it is reasonable to suppose that with ligation of the vas atrophy takes place. At any rate, neither in the course of convalescence nor subsequently have we encountered any difficulty whatever with the vesicles which have been excluded from their normal urethral drainage.

I wish it to be clearly understood that I claim nothing original about the type of operation performed in this small group of cases. As you will see by reference to the drawings, Young's operation for total excision of the prostate for carcinoma has been adapted to the fibrous gland, to which adaptation this operation is particularly well fitted. I wish you to look upon this group of cases as an experimental group and to remember that I have but slowly developed it in order to give sufficient time to determine the final end-results as to function in these cases before doing a larger series. I feared that the scar tissue formation about the prostatic cavity might be sufficient to cause contraction of the prostatic urethra to a degree in excess of that which usually takes place following any type of prostatic removal. It is only since I have satisfied myself that such contraction had not taken place, following my review of those cases, that I have been willing to adopt the operation, but have not included the latter cases in the list given in Table 1. The end-results of the two operations seem to be equally satisfactory.

Postoperative return to function averages for the group of 15 cases, fourteen days, with 7 cases in the neighborhood of ten days. It was rare that urine leaked through the perineal incision at all, and equally rare that blood complicated drainage in any degree whatever following operation. The comfort of the patient was distinctly noteworthy. There was no operative mortality. One patient, satisfactorily convalescent, returned to the

hospital after a period of stay-at-home and died of pneumonia. His chief handicap at the time of operation was emphysema of the lung. There was but one case in which the functional result was not entirely satisfactory. That patient showed some dripping for a period of four months, but has since entirely recovered. In one other case a two-ounce residual persists. The urine has entirely cleared from pus and bacteria. This was noted at the end of a year and six months following the operation. The patient entered the hospital in uremia having had a long-standing overdistention with a very thick bladder wall showing extensive fibrosis. After a preliminary preparation of fifty-seven days, the perineal operation was done. I do not believe the type of operation influenced the persistance of residual, but rather that it represents the condition of the bladder. There has been no occasion for any reoperative measures of any kind whatever. The urethras are uniformly smooth, admit a sound or cystoscope freely, and show a functioning internal urethral sphincter. I believe this type of operation has a definite place in prostatic surgery for a selected group of cases lying between those where satisfactory relief can be obtained by cautery or punch operation, and the typical prostate, a benign hypertrophy, which is treated either by the suprapubic or the perineal route by enucleation. It affords satisfactory end-results in a group of patients in which they have been least satisfactory. In addition it appears from the results as tabulated in this group of cases, the oldest of which is five years since operation, to prove that the operation affords a permanent and adequate relief of symptoms.

DISCUSSION OF PAPERS BY DRS. BIDGOOD AND CRABTREE

Dr. Benjamin S. Barringer: Dr. Bidgood's paper was of great interest to me, but I am confident that I will have to read it over carefully to see why cocci attack the cortex and colon bacilli the pelvis of the kidney. I confess that I do not understand this, though I know that both Dr. Crabtree and Dr. Bidgood consider this to be the case. I should like to hear Dr. Bidgood's explanation.

The results shown by Dr. Crabtree's operation are most extraordinary. I fear (even though I may be alone in such a statement) that if I took 15 of my best prostatectomy cases and measured the residual after operation, I would find at least one-half of them with one dram to one-half ounce. Possibly it might not exist, and perhaps the amount is exaggerated; but I am quite sure that probably 13 out of the 15 would show residual. His extraordinary results in this direction was the first thing which struck me in considering his operation. If he can get such good function in a condition which has puzzled all of us for a good many years, I think we should adopt this operation ourselves.

Dr. Barringer: I cannot precisely follow Dr. Crabtree's technic, because fibrous prostates do not dissect out bluntly in my hands, probably because they are done suprapubically and I do not know how to do this perineal operation. I want more than anything I have heard of lately to see him perform the operation, and see what I can make out of a heretofore puzzling condition.

I am a poor one to discuss this subject, because for years I have advocated no operation for various conditions of the sort, such as carcinoma of the prostate, conditions of the trigone and of the bladder neck, etc. The less operating, the better, has been my opinion, having in mind the patient's condition rather than the operation itself. That is nothing against what Dr. Crabtree has said, however.

At any rate, I think it is time I saw Dr. Crabtree do his operation, as his results are even more extraordinary than would at first appear when we consider how bending-over-backwards he is in the matter of accuracy in recording end-results, checking up statistics, and the like.

Dr. Thomas J. Kirwin: Dr. Crabtree's paper has, it seems to me, defined with acuteness a problem over which controversy has been waged for a generation. I have listened to discussions of this character by urologists whose leadership in the profession is a matter of common consent. It has occurred to me that after all has been said the controversy represents no real differences of principles. Nobody denies that irrespective of method or

technic, the chief objective of any prostatectomy is preservation of the sphincters without injury to the rectum or the ejaculatory ducts. Fundamentally, then, the question is whether that objective may be more successfully reached suprapubically or perineally. As you all realize, of course, the situation is perplexed by practical considerations in individual cases. Dr. Keyes only last week made us the beneficiaries of his long experience when he read before the Academy of Medicine his illuminating paper upon the "Prospects of the Prostatic." In the discussion which followed emphasis was again put upon the practical aspects of the problem. There was apparently an agreement that the operator should employ the method in which he was most proficient. The practical force of this suggestion has a strong appeal, but I feel it has a tendency to react as an obstacle to progress. However, I take it that even the most partisan of suprapubists will hardly fail to be convinced by Dr. Crabtree's reasons for preferring the perineal method. Cases of small fibrous prostates, as he has made plain to us, present difficulties all their own.

In a résumé of recent statistics of perineal versus suprapubic prostatectomies, I find the following:

Young: 1049 Prostatectomies by "conservative perineal" procedure, with 36 deaths in hospital (3.4 per cent). 108 Suprapubic prostatectomies, in 55 of which final results are known 76 per cent were stage procedures—final results good in 60 per cent.

Davis, Edwin: 91 Perineal operations under sacral anesthesia with 1 death (1.1 per cent). Average age of patients, seventy years, with 9 men over 80.

Hinman: Personal cases (number not known). Mortality was between 2 and 3 per cent. In 95 per cent of the surviving cases the cure was complete. There were no persistent rectourethral fistulae and no incontinence of urine as a result of the operation.

Lowsley: Suprapubic cystotomy, 8.4 per cent; perineal, 5.7 per cent. It is only fair to state that these figures include all the staff and residents.

Keyes: 76 Entered hospital, and 11 died there, a total mortality of 14 per cent. Among the 76 patients 10 were not operated upon at all, 3 died promptly without operation, 7 others were temporarily relieved without operation, 4 died after preliminary suprapubic drainage, and another having been drained refused prostatectomy.

Dr. Bidgood's paper was not only a scientific contribution, but a constructive one. I believe that the gist of his paper was, as he stated (after the work of Dyke of London, England), that the typhoid group and the cocci group of bacteria enter through afferent vessels and have a predilection for the cortex of the kidney, causing carbuncles and perinephritic abscesses. But to me the most important point was the fact that typhoid bacilli and the colon group not only enter by way of the afferent vessels, but pass out through the efferent route into the collecting tubules, causing huge pyonephroses. This type usually results in complete loss of function and nephrectomy. I remember that Dr. Lowsley cystoscoped a patient on whom a diagnosis of perinephritic abscess has been made (in which Dr. Keyes concurred) in spite of the fact that the urine was clear. Bacteriological examination of both specimens showed them to be clear and sterile, but a perinephritic abscess was nevertheless suspected, which was found upon operation to be due to a coccus infection.

Dr. John H. Morrissey: I would like to know just what Dr. Crabtree means by fibrosis of the prostate. These cases come to us as purely urinary conditions presenting a symptomatology similar to that of the prostatic in general, i.e., dysuria, retention and symptoms of infection. I should like to know on what he makes a diagnosis of fibrosis: digital, cystoscopic or radiographic evidence.

Excluding a ball valve adenoma, which is especially definite, it seems to me that these cases can be classified as anything you want to call them: median bar, contracture of the vesical neck, etc. In the absence of these particular conditions, then, we come to the point where we are dealing with a chronic infection. We are probably all familiar with the recent work of Von Lackum, of the Mayo Clinic, who reported a large number of cases all of which responded adequately to treatment directed towards infection of the prostate, following a punch operation. Bumpus originally reported a punch series showing striking results, with relief of obstruction, etc. Von Lackum later found the results not entirely satisfactory in these cases, but obtained even complete relief by eliminating the infection. Of course in a consideration

of any cases from the Mayo Clinic one must always remember the departmental limitations of that institution. Anyone doing surgery will naturally favor his own particular procedure, and Von Lackum's reports naturally reflect his own department, where he is restricted to massage, the use of dilators and sounds, etc. I believe, however, that in the absence of any pathology in these prostatic cases, as noted previously, they may be considered as merely chronic infection and treatment should be so directed. Not every patient will let you cut into the urethra and attack the prostate through a perineal incision, unless he can be convinced that he has a definite surgical condition. It is therefore necessary for the most part to direct treatment towards elimination of the infection. If this cannot be done, then perhaps a perineal operation is indicated.

Unless one is familiar with the technic of the perineal operation, he cannot appreciate how minor this may be as far as the patient is concerned. The mortality is relatively nil, and the discomfort quite minor.

In any large series of seminal vesiculectomy operations that I have done in the past I felt the results were due not so much to removal of the vesicles as a liberal incision and drainage of the prostate. I have seen prostates fully the size of an English walnut come down to that of a small almond following some 8 or 9 linear incisions. Although Dr. Crabtree has removed the whole gland in these fibrous prostate conditions, as he calls them, I think his results are due principally to relief of the infection. Whether this could have been accomplished just as well by draining the area, removing a small adenoma if present and avoiding the sacrifice of the pieces of gland left, is the question. I do feel and know that complete removal of the gland is a radical procedure; and in many cases of complete removal and suture of the vesical neck to the severed ends of the urethra, urinary control is hard to get. Undoubtedly in all these perineal operations a good part of the control is due to a resulting scar. Possibly in chronic infection we do have a scar which maintains control. Surely if we excise an entire prostate we run a serious risk of getting dribbling and lack of control as a result. I would be very much interested to know what the sections from the glands removed showed: whether chronic infection, whether the remaining glandular tissue was entirely obliterated by the fibrosis, or whether or not there were any indications of carcinoma cells in the slides.

My point of view towards these kidney cases is not so much a consideration of what the causal factor may be, but what to do with them. In the first case Dr. Bidgood showed here, my view would be that we were dealing with a healed tuberculosis of the kidney with secondary colon infection, and that the kidney should be removed. I must say that my interest would be limited to that consideration alone in such a case.

Dr. Nathaniel P. Rathbun: We are all familiar, of course, with the theory of the bacterially infected pelvis draining into the urinary tract, and that cocci have a habit of attacking the cortex, cortical infections very many times giving clear urine in the presence of a serious infection of the kidney. However, I did not quite gather from his paper why this occurs.

I think Dr. Crabtree has made an important and original contribution. Dr. Crabtree has had the courage to do a radical operation for a condition which has puzzled all of us. My results in using chiefly the suprapubic approach have never been entirely satisfactory. Several cases where on a second occasion we have opened the bladder widely, with full exposure, and excised portions of a bar with the knife or endotherm, have proved fairly satisfactory, although not to the degree that Dr. Crabtree mentions.

Dr. Crabtree has called his group of cases a small one, but to me it would be large considering the fact that there was no residual. I have had no results approaching his. It occurs to me that it behooves those not familiar with the perineal route to perfect themselves in that technic, and make more frequent use of this operation.The danger, however, lies in the possibility of many cases of incontinence if this original operation of Dr. Crabtree is employed indiscriminately, as it requires a high degree of technical skill.

I confess that I have not had much success with the Young punch or the method advocated by Dr. Collings. I have had some cases where the obstructing bar was removed with the Stern knife. I get better results from the suprapubic approach.

Dr. A. R. Stevens: I think we have all realized for a long time, as has Dr. Bidgood, that the common pyogenic organisms were the ones usually encountered in perinephric

infections, and that it is exceedingly uncommon to meet any member of the colon group. I should want to read his paper over to thoroughly understand his explanation of just why cocci attack the cortex of the kidney and colon bacilli the pelvis. I hope that Dr. Crabtree will discuss Dr. Bidgood's paper, as I think it was prior to the War that he and Dr. Cabot came down here and read a paper on the subject.

At that time Dr. Cabot had a great deal to say about the "long wheel base" of the colon organisms, and in some way amusingly explained it on that basis. I think perhaps that might help to fix the idea in our minds. However, staphylococci are not only found in perinephric infections. It is not a very unusual experience to meet staphylococci with pus in catheterized specimens of urine. To me they have been very difficult cases. I have had three or four very distinct, clean-cut cases of staphylococcus infection (obtained in pure culture) confined to the pelvis and immediately adjacent portions as far as I could make out, on which I tried various dilatations and irrigations without accomplishing anything. One case was freed from the infection by giving intravenous neosalvarsan. In all cases I tried capricol, the drug supposed to be prescribed in such cases; but without benefit.

The very nice way in which Dr. Crabtree has worked out his whole group is to be commended. It seems to me, however, that cases diagnosed as fibrous prostate: i.e., trigonal, vesical neck or median bar conditions, should first of all be treated by some simpler therapy, some form of punch or cautery. Dr. Crabtree thinks he can pick the individuals cases which cannot be helped in that way and will require his more extensive prostatectomy, and I would be glad to know just how that conclusion is arrived at. It seems to me that of the cases which are generally regarded as fit subjects for the various punch operations, three groups have proved unsuccessful: (1), where there is a spinal cord lesion which has not been recognized; (2) the group occasionally met in which there are definite hypertrophied intraurethral lobes (and all cases of this kind should be examined as carefully intraurethrally as intravesically to exclude hypertrophied lobes); and (3), the group which I suppose prompted this more radical operation: that without intraurethral lobe and without spinal cord lesion. In these cases we at Bellevue have employed the punch operation frequently, with suprapubic control, and have found that after removing four or five obstructing pieces and in some cases going a step beyond and with a scalpel cutting through any remaining scar so that a perfectly pliable posterior aspect to the vesical outlet was left, certain individuals have not become well. A few such cases have been operated upon four times. I had supposed these were individuals who had a very marked predilection for the formation of scar tissue with infection, and of course all these cases have infection after they are opened up. However, they may represent prostates with scar formation extending very deep into the gland. On the basis of either explanation, such individuals would be ideal subjects for Dr. Crabtree's operation.

Dr. Clyde W. Collings: I think Dr. Stevens hit the nail on the head when, in discussing Dr. Crabtree's paper, he mentioned the question of diagnosis. The reason transurethral operations fail is that the patient has intraurethral lateral lobes as well as a fibrous bar, or (as found recently in a Bellevue patient) an enlargement of the subtrigonal type. In this instance we remove two benign lobes underneath the trigone, the size of a small English walnut, after the patient had been punched per urethra or suprapubically four times. Then again, some patients may have a fibrous bar plus a median lobe. We will be asked by the patient or his doctor to do a transurethral operation. These operations usually fail.

It seems to me that if we stick to our knitting and follow only the absolute indications for the transurethral operation, we will be delighted instead of disappointed with the results. I have always stressed the point that this method of cutting through the prostatic urethra with the high frequency current should only be used where there is a definite fibrous bar with a cystoscopic picture of the bas fond, and elevation of the neck of the bladder, as the instrument is withdrawn into the posterior urethra. Sometimes we see a fibrous scar obstructing the neck of the bladder after prostatectomy. This is entirely relieved by the cutting current. And thirdly, patients with obstructing bar due to carcinoma of the prostate, can usually be relieved of their residual urine and put off the time when they will probably come to a suprapubic tube.

Dr. Maximillian Stern: I agree with Dr. Collings in saying that Dr. Stevens hit the nail

on the head with regard to small fibrotic prostates. However, I cannot agree entirely with Dr. Collings as to resection and diathermy methods.

This gives me an opportunity to tell Dr. Lowsley that his "I told you so" was absolutely correct. At a time when I was very enthusiastic over the resectoscope he said that I would live to say that he was right in contending that it was applicable to only a limited number of cases. The temporary results obtained in frankly infected cases were, I think, entirely due to the fact that we got drainage for a time. All of these prostates undergo the atrophic process of normal senile degeneration until (probably due to the incidence of infection) they get so bad that surgery is the only recourse. However, many people agree with me that operative methods are not the only way of handling a prostate until infection gets out of hand. Up to a certain time it is only proper to try to deal with these prostates as organs normal in all other respects. Very good results are obtained by dilatation, massage, hydrotherapy and diathermy, and in a growing number of cases prostatectomy is averted.

In connection with infective processes and vasligation, I would mention an idea which recently occurred to me. I had an old gentleman as a patient, on whom a vasligation had been done with the idea of causing prostatic atrophy. The prostate and seminal vesicles were infected; the two lateral incisions over the vasa broke down and remained open. These persisted as points of drainage from the vesicles. This case suggested the plausibility of cutting across the vas and letting the distal end drop into the scrotal sac, and of sewing the proximal end to the open wound to permit of drainage. This I have never done but it seems more logical than simple ligation.

In any case, I cannot say that I approve of vasligation in general, and in infected cases I am especially opposed to it.

In frankly fibrotic prostates such as Dr. Crabtree describes I still believe that resection, together with other therapeutic measures, will yield results superior to major surgical procedure.

Dr. George W. Stark (Syracuse, N. Y.): I have only two observations to make on these very interesting papers. One is that in Syracuse, as in other smaller cities, we get out cases earlier because of our closer contact with the internist, resulting in a better chance of curing them without surgical interference. The other is that the Bostonians have been trying for years to put over the theory that certain infections attack certain parts of the urinary tract, because of its embryological development; but I do not think that this theory will work out any better than the rest.

Personally, I do not think all perinephric abscesses arise from the kidney, but that they can come from the outside and approach that organ. Two weeks ago a woman came to me who on examination was found to have a mass in the upper right quadrant. There was nothing pathological in the kidney, the function was normal, and I was so positive that there was no connection with the kidney that I advised an anterior incision. A large inflammatory mass was found attached to the capsule of the kidney. The capsule was free. I believe that had this case been allowed to go on longer, she would have had a perinephric abscess. In such instances, of course, the theory of infection suggested by Dr. Bidgood would not work out.

I have made cultures of several hundred cases of kidney infections, and while the preponderance showed colon bacilli, quite frequently staphylococcus aureus, and once or twice a streptococcus was found.

Dr. C. Y. Bidgood (*Closing*): I realized before presenting my paper this evening that it was more or less theoretical and had no apparent practical application, as has been pointed out in the discussion.

Assuming that the idea is correct that the colon bacillus tends to attack that part afferent to the glomeruli, Dr. Barringer and Dr. Rathbun have both asked why. I confess that I do not know, unless it can be explained on the basis of bacterial selectivity.

Dr. Morrissey mentioned the possibility of tuberculosis on the basis of the pyelogram shown, as of course anyone would. The case was considered from that viewpoint, too, until numerous microscopic sections from all parts were made and no evidence of tuberculosis was found.

Dr. Stevens' report of a case cured by intravenous neosalvarsan was interesting, because I supposed that when a small abscess due to a coccus infection ruptured into the afferent tubules there would immediately be drainage into the pelvis which would result in a positive culture in the urine. According to Dr. Stevens, he did not get much result from pelvic lavage, probably because lavage would not reach the ultimate source high up in the parenchyma. Cocci often respond to intravenous neosalvar-

san, presumably because it reaches that portion of the kidney afferent to the glomerulus.

Dr. Stark has made some interesting remarks about perinephric abscess. We all know that originally they were classified as primary and secondary, i.e., primary where one could find no abscess in the kidney to account for the perinephric abscess, and secondary where such an abscess was found. That nomenclature has been altered, and those cases in which we find no abscesses in the kidney itself designated as paranephric. Those to which Dr. Stark has called attention are the paranephric type, a slightly different condition from that considered here.

Dr. E. G. Crabtree (*Closing*): The reception accorded the new idea I have presented (or perhaps I had better say "adaptation of an old idea") has been very gratifying.

The question raised by Dr. Barringer regarding my good results as far as residual is concerned leads me to ask him to define normal limits of bladder emptying; that is, how often the normal bladder really empties itself. I have recently considered residual urines in our work on pregnant women at the Boston Lying-In Hospital, only to find wide variation in function in the same patient. If I get complete emptying on most occasions, I take that as a determination of residual. If one took the top figure rather than the lower point in determining residual, quite a marked difference in the degree of function would be shown.

I agree with Dr. Stevens in his statement as to the difficulty experienced in deciding by cystoscopic means alone what kind of prostate we are dealing with. The one-eyed vision offered is not sufficient. I trust that the future will add something more definite to our ability to diagnose these cases. At my clinic we are cystoscoping all of our prostatic cases, and doing cystograms and urethrograms in addition. By comparing these findings and the picture noted at operation with the specimen obtained, we feel that we have learned a little, and may in the future become more expert.

Some confusion seems to exist as to what type of prostate I am operating by the method described. A fibrous prostate is defined as the kind which when felt by rectum is small, not nodular but elastic, and does not raise the question of malignancy. Cystogram shows no deformity of the bladder. Urethrogram shows a short prostatic urethra. In such cases we do total prostatectomy, providing a smooth, regular prostatic urethra through which urine passes as readily as in the postoperative benign hypertrophy. I do not wish you to infer in any way that the paper presented here tonight is antagonistic to the work of Dr. Collings and others in handling the prostatic bar. These patients belong to a different group. Dr. Collings had made it clear that he *cuts prostatic bars*, but varies from that procedure when there is some other form of obstruction. The group I spoke of is intermediate between Dr. Collings' cases and the ordinary type of prostate in which some surgeons (as Dr. Rathbun has mentioned) do a suprapubic dissection. The method which I have followed for these cases has proved a satisfactory way for me to meet the problem.

Dr. Stevens and others have mentioned prostatic treatment by massage. We are not talking about the same group of cases. I recognize that there is a hard prostate typical of chronic infection and also one which is atrophic and fibrous but obstructive.

Total prostatectomy for carcinoma and that for a fibrous gland are operations of very different magnitude, the former very often technically difficult, the latter much easier. Its virtue in these cases lies in better functional results and more certainty in obtaining satisfactory end results.

Let me say a word in regard to the "long wheel base" of the colon bacillus. I agree with Dr. Bidgood that this is only a theoretical consideration, and I realize that we are on disputed ground. Dr. Cabot and I contended that even though a coccus pyelitis may occasionally be found, the characteristic lesion of the coccus was abscess formation, that of the colon bacillus, tubular inflammation. The work Dr. Cabot and I did some years ago reported data based on pathological examination of tissues taken from the kidney and perinephric region at operations in which an abscess had been found. The group of specimens were examined and sections stained for bacteria instead of relying on cultures where overgrowth of other organisms by the colon bacillus might occur. True perinephric abscess rarely showed any other organism than the coccus. I believe there were but two cases in which bacilli alone were found, and these were not colon bacilli. I still think, after ten years, that if we rely on cultures less and on sections stained for bacteria more, perinephric abscess will be found a coccus disease, and the renal reaction to the "long wheel base" colon bacillus that of a distinctly different disease.

INTRAVENOUS INJECTION OF GLUCOSE

ITS EFFECT ON THE RESPIRATORY QUOTIENT*

HARRY KOSTER, M.D., F.A.C.S., W. S. COLLENS, M.D. AND M. A. GOLDZIEHER, M.D.

BROOKLYN, N. Y.

FROM clinical reports the armamentarium of the surgeon has been augmented by a very important factor in the intravenous administration of glucose. During the past five or six years reports from all over the world speak favorably of such intravenous administrations in the treatment of all types of postoperative complications, ranging from slight nausea and vomiting, attributed to anesthesia, to the dehydrating and debilitating effects of such very serious complications as peritonitis and intestinal obstruction. Wherever acidemic states are even remotely suspected its use is advocated very urgently. All types of toxemias have been cited as indications for its employment and almost uniformly the results have been reported to be favorable. In all instances these reports are the results of clinical observations. In no instance that we know of have the results been checked up in a scientific manner, nor is there any explanation based on a scientific foundation of the means by which it accomplishes improvement. A consideration of these facts led us to the problem which is as follows:

1. What happens to glucose after it is injected intravenously?

2. What influence does it have upon the postoperative state?

There are two possible ways in which glucose may be of value to the body. One which immediately suggests itself is its value as a fuel. The other method by which it may be of value is as a foreign body irritant which when introduced into the blood may stimulate the defense mechanism. We shall concern ourselves solely at this time with the consideration of the value of glucose as a fuel in the body.

The history of metabolism is definitely associated with the recognition of the value of the respiratory quotient as a method for the determination of the relative utilization of the various food stuffs, fats, carbohydrates and protein. Normally in the postabsorptive state after a fourteen to eighteen hour fast the respiratory quotient ordinarily is between 0.78 and 0.82. When proteins alone are burnt the respiratory quotient is about 0.82 and when fats alone are burnt the respiratory quotient is about 0.7. When a glucose plethora is produced in the blood either by the ingestion or intravenous injection of sugar, the respiratory quotient rises toward unity. During the postabsorptive state a rise in the respiratory quotient after the administration of glucose is to be expected normally. Woodyatt[1] has demonstrated that in the normal animal or in man, assimilation of glucose can go on to the extent of 0.8 to 0.9 gm. per kilogram body weight per hour. In order to be certain that we produced a carbohydrate plethora in our experiment, we used these figures and gave 50 gm. of glucose intravenously per 60 kg. of body weight.

METHOD

This consisted of the determination of the respiratory quotient after a fourteen to eighteen hour fast, the administration of 50 gm. of glucose intravenously (250 c.c. of a 20 per cent solution) followed by another respiratory quotient one half hour later. Blood-sugar determinations before and after the glucose administration were also made. This represents the control experiment. The same procedure was then carried out at the time of operation, the glucose being administered during operation and the respiratory quotient determined immediately after the operation within one half hour after the administra-

* From the Departments of Surgery and Pathology, Crown Heights Hospital, Brooklyn, N. Y.
Submitted for publication, March 11, 1930.

tion of glucose. Spinal anesthesia which does not affect the quotient, was used in all cases. Unselected cases in which various types of abdominal operations including hernias were performed. The procedure used in the control experiment was subsequently repeated at intervals over a period of sixteen days. Cases with postoperative febrile states were not included because it was felt that the respiratory quotient obtained under such conditions might be misleading. In a few instances in which there was postoperative fever the respiratory quotient was also determined and the results will be cited separately.

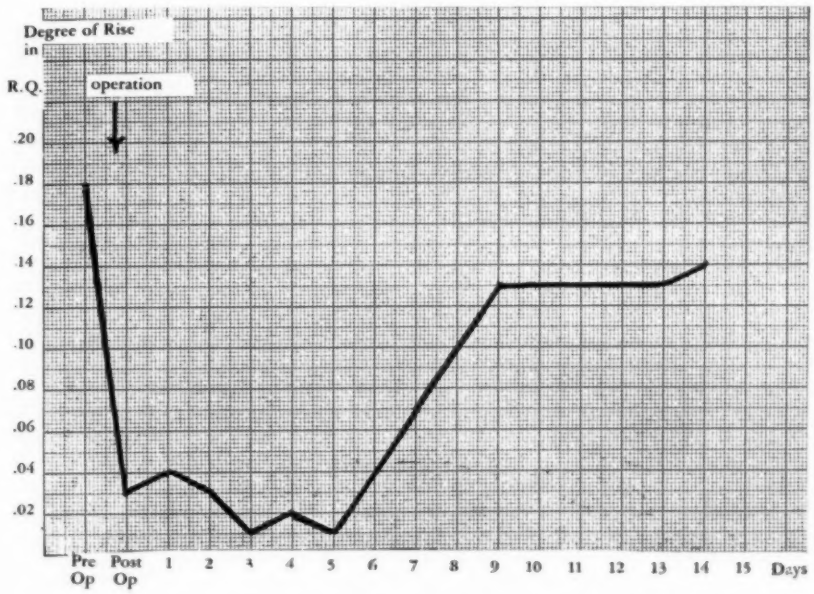


Fig. 1. Degree of rise in respiratory quotient following intravenous glucose administration.

All determinations were made with the Bailey modification of the Tissot calorimeter and the Henderson modification of the Haldane gas apparatus. Blood sugars were determined by the Folin Wu method. Precautions were taken to obtain the proper mental and physical relaxation before the respiratory quotient estimations were made. All determinations were performed by the same individual.

APPARATUS AND METHOD

The Bailey calorimeter is used to determine the respiratory exchange of the body from which energy metabolism can be calculated and the relative part that each food stuff plays in its production.

The subject inspires outside air. One-way valves automatically partition the inspired from the expired air. The expired air is collected in a balanced spirometer for a period of approximately ten minutes. The CO_2 and O_2 content of this air is then determined by gas analysis.

The O_2 and CO_2 of outside air being known, the difference between these and the CO_2 and O_2 of the expired air represent the O_2 consumed and CO_2 excreted in the internal respiration of the body. From this data, the energy metabolism of the body is obtained.

A face mask was used in all the determinations. The mask was tested for leaks regularly, and supported by a large rubber dam binder to seal the edges.

The valves for partitioning the air are made of soft gum rubber and completely collapse when the current is reversed.

The spirometer has a capacity of 100 liters. The bell is counterbalanced in any position by a chain and counterweight. Only expired air is collected in the spirometer. The volume of gas collected during

a determination is brought to standard conditions by correcting for temperature and pressure. The air sample for analysis is collected with a Bailey sampling bottle.

The Henderson Haldane gas analyzer was used in our work. The accuracy of the determinations were maintained by checking the analysis of the sample on two different machines. Although at the outset of our experiments we employed the usual alkaline pyrogallate solution for absorbing the O_2, our subsequent determinations were performed with oxsorbent. We found it much superior to pyrogallate solutions from the standpoint of speed and accuracy in taking up all the O_2 in the sample.

RESULTS

The results of studies in 14 cases are charted in Table 1. These are typical of the 30 cases studied. Eight preoperative controls are presented which uniformly indicate a decided rise in the respiratory quotient following intravenous glucose administration. In 4 of the cases charted, immediately postoperatively there is a decided diminution in the rise of the quotient following the glucose injection. The 2 cases which show 0.04 and 0.05 rise respectively were complicated in that the quotients were determined at a time when there was no longer any anesthesia, and when the patients were beginning to experience severe pain to which they responded by marked physical and mental activity. From the first to the sixth day there was no rise in the quotient excepting in Case IV, in which there was a rise from 0.69 to 0.76. These figures, however, are still within the range of quotients obtained when fat alone is oxidized. From the seventh day on there is a definite tendency toward elevation of the quotient after glucose administration. The longer the interval of time between the operation and the determination, the closer the approach of the quotient, after glucose administration, to the normal. In starvation, when the liver has been depleted of its glycogen, the administration of glucose fails to elicit a rise in quotient because of its immediate conversion into glycogen and storage. During acidemic states the true nature of the quotient may be obscured by the pathological elimination of CO_2. In the cases studied both these sources of error were eliminated. The patients were not starved, and the absence of acidosis was shown by determinations of the CO_2 combining power of the blood.

DISCUSSION

It can be seen from these studies that there is no rise in the respiratory quotient following intravenously injected glucose for approximately one week after operation. The slight variations observed are within the limits of experimental error. This period coincides with the clinically critical postoperative period. The failure to obtain a rise in the quotient occurs at a time when the physical restlessness and mental anxiety would under ordinary conditions in themselves produce a rise. Thus the inability to produce a rise in the respiratory quotient following glucose administration is particularly significant. Similar results have been observed in experimental animals. Collens and Murlin[2] in unpublished results were unable to produce a rise in the quotient following intravenous glucose in animals with their hepatic arteries ligated. Cori and Cori[3] observed no rise in the quotient following glucose in eviscerated rats.

The glucose injected cannot be accounted for by the respiratory quotient. Apparently then the postoperative state is definitely associated with an inability to utilize glucose. The fate of this glucose is now under investigation and will subsequently be reported.

Two cases reported show the effect of insulin during the postoperative state. In both cases there is a uniform and decided rise in the quotient following its injection. This suggests the possibility that insulin stimulates the oxidation of glucose during the postoperative state.

It is also suggested by these studies that

TABLE I

Case No.	Hosp. Case No.	Date	Operation	Preop. Control	Day of Op. Postop.	Day Postop. 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
I	4969	9/28/29	Cholecystectomy	Pregluc. .73	...	...	.73	....	....	....	....	....	....	....	.77						
			Appendectomy	Post .90	...	...	.77	....	....	....	....	....	....	....	.88						
II	4984	9/30/29	Cholecystectomy	Pregluc. .71	...	...	....	.75	....	....	....	....	....	.85							
			Appendectomy	Post .97	...	...	....	.75	....	....	....	....	....	1.0							
III	6084	10/21/29	Exploratory Lap. Ca. of Gall Bl	Pregluc. .70	.72	...	....	....	....	....	....	....	.74								
			with Metastasis	Post .89	.73	...	....	....	....	....	....	....	.99								
IV	6158	10/28/29	Appendectomy Suspension of Uterus	Pregluc. .72	...	.69	.66	....	....	....	....	....	....	.75							
			Myomectomy	Post .87	...	.76	.68	....	....	....	....	....	....	.86							
V	6214	11/ 2/29	Appendectomy	Pregluc. .73	...	...	....	.77	....	....	....	....	....	.71							
			Separation of Adhesions	Post .86	...	...	....	.72	....	....	....	....	....	.83							
VI	6269	11/ 7/29	Left Oophorectomy	Pregluc. .69	...	...	....	....	....	.73	....	....	....	....	....	....	....	....	.77	....	....
			Sep. Adhesions for Intest. Obstr	Post .87	...	...	....	....	....	.76	....	....	....	....	....	....	....	....	.90		
VII	3892	6/24/29	Thyroidectomy	Pregluc. .70	...	...	....	....	....	....	....	....	.76								
			Right lobe	Post .80	...	...	....	....	....	....	....	....	.79								
VIII	4189	7/20/29	Herniotomy	Pregluc. .77	...	...	.70														
				Post .95	...	...	.71														
IX	4075	7/10/29	Cholecystectomy	Pregluc. .73	...	.74	.75	....	....	....	....	....	....	....	....	....	....	.75			
			Appendectomy	Post .86	...	.75	.79	....	....	....	....	....	....	....	....	....	....	.86			
X	3844	6/20/29	Exc. Gall Bl. App. Ventral Fixation	Pregluc.	.73	...	....	....	....	....	.70	....	....	....	....	....	....	....	....	....	.75
			Perineorrh. Hemorrh	Post	.78	...	....	....	....	....	.71	....	....	....	....	....	....	....	....	....	.76
XI	4354	8/ 6/29	Suprapubic Cystotomy	Pregluc.	.73	...	....	....	....	....	....	.74	....	....	.72						
				Post	.74	...	....	....	....	....	....	.76	....	....	.78						
			Prostatectomy			...	....	....	....	....	....	.82*	....	....	.82*						
XII	6167	10/28/29	Cholecystectomy	Pregluc.	.73	...	....	....	.70	....	....	.75									
			Appendectomy Exploratory Lap	Post	.77	...	....	....	.72	....	....	.86									
XIII	4317	8/ 2/29	Cholecystectomy	Pregluc.	.70	...	....	....	....	....	....	....	....	....	....	....	....	.72			
			Appendectomy	Post	.81*	...	....	....	....	....	....	....	....	....	....	....	....	.75			
					...	...	....	....	....	....	....	....	....	....	....	....	....	.82*			
XIV	4069	7/ 9/29	Cholecystectomy	Pregluc.	...	...	....	.74	....	....	....	.76	....	....	....	....	....	....	....	.73	
			Appendectomy Perineorrhaphy	Post	...	...	....	.73	....	....	....	.84	....	....	....	....	....	....	....	.97	

*Respiratory quotient following intravenous administration of 17 units of insulin.

the inability to utilize sugar runs parallel to the severity and the duration of postoperative shock. The patient in CASE VII who was subjected to a very extensive operative procedure and who had a left internal saphenous vein phlebitis from the eleventh postoperative day on, is illustrative. The patient in CASE XIII who was operated on for a gangrenous cholecystitis had a prolonged and troublesome convalescence. These two were the only cases in the series who ran stormy postoperative courses and at the same time were the only patients who sixteen and thirteen days respectively after operation showed no rise in the quotient following glucose injection.

It appears from these results that the administration of glucose early in the postoperative state is of questionable value as a fuel. Following operations a large percentage of patients suffer to a greater or less degree from vomiting. These patients who cannot retain, digest and absorb foods, burn their own reserve of carbohydrates and fat and have a tendency to develop an acidemia which in turn favors further vomiting. Intravenous glucose has been strongly advocated as the panacea in these cases; but according to our results, there is no evidence to indicate that the exogenous glucose at this stage can spare fat and protein breakdown.

CONCLUSIONS

1. The respiratory quotient does not rise following intravenous glucose administration after abdominal operations for a period of approximately one week.

2. Insulin may be able to stimulate the oxidation of sugar during this period.

3. The postoperative state is definitely associated with a disturbance in carbohydrate metabolism.

NOTE: We desire to express our thanks to the members of the Staff of the Crown Heights Hospital whose cooperation made it possible to secure the clinical material for study.

REFERENCES

1. WOODYATT, R. T. *J. A. M. A.*, 66: 1916, 1910.
2. COLLENS and MURLIN. Personal communication.
3. CORI, C. F. and CORI, G. T. *Am. J. Physiol.*, 9: 317, 1929.

MANAGEMENT OF THE THYROID HEART*

JOHN C. RUDDOCK, M.D., F.A.C.P., AND C. G. TOLAND, M.D., F.A.C.S.

LOS ANGELES, CALIF.

THE "thyroid heart" as commonly known is that heart condition or abnormality which is found in patients who present themselves for the treatment of a thyroid dysfunction.

This paper is prompted because of controversies between surgeons in respect to the use of digitalis in the preparation of thyroid cases for surgery. Should digitalis be used in all cases? If not, in what type of case is digitalis indicated? Or should digitalis not be used? In this discussion the merits of the different types of treatment (medical, surgical or radiological) for goiter will not be considered.

Every surgeon handling goiter cases should associate himself with an internist or cardiologist and should have a careful study of the cardiac condition made before surgery is attempted. In no other condition will a close cooperation between the internist and the surgeon so strikingly improve the service to the patient as in the surgical treatment of a thyroid dysfunction.

The thyroid heart is a disordered action of the heart as seen in cases of thyroid disease. It is most frequent in cases of exophthalmic goiter (Graves' disease) and the so-called toxic adenoma. Although we may find occurring simultaneously with goiters any or all of the conditions which may occur in heart disease, still there is nothing that can be found macroscopically or microscopically that is pathognomonic of thyroid disorder. It is a functional disturbance, and should be considered as a disordered action of the heart dependent and secondary to a disease of the thyroid gland which *cannot be cured* unless the causative agent is eliminated, namely the *thyroid disorder.*

PATHOGENESIS OF THE THYROID HEART

The disordered action of the heart is dependent upon a disordered function of the thyroid gland, except in those cases in which an enlargement of the gland or its position mechanically, through pressure, etc., alters the functions of neighboring structures and is the cause of cardiac disturbances (goiter heart of Rose).

There is an increase in size of the thyroid gland with an increased vascularity and a corresponding hypersecretion of the gland. Plummer believes that so-called toxic adenomata produce a pure hyperthyroidism and that the excessive secretion differs in no way from the normal secretion; but in exophthalmic types the secretion is not only excessive, but is qualitatively changed from the normal. According to Kendall this change is brought about by an alteration of the imino group (CO-NH) and not a change in the iodine content. Regardless of what the chemical change is or the type of goiter with which we are dealing, there is a profound effect upon the nervous system. These patients as a rule are nervous and emotional. They speak and move quickly. Tremors of the hands and tongue are common and we have a symptom complex that is identical with an overstimulation of the sympathetic nervous system (sympatheticotonia).

The activities of the internal organs are by no means so dependent upon nervous control as are the activities of the voluntary muscles. If the nerve supply to the latter is interrupted their activities cease. If it is interrupted in the former, no serious results necessarily follow. Nervous impulses modify and direct the activities of the internal organs but are not essential to a continuation of these activities. The central vegetative nervous system has a depressor action whereas the sympathetic system has an accelerator action. There is a definite something secreted or controlled by the thyroid gland which controls the balance between these two

*Read before the Pacific Coast Surgical Association, February 22, 1929.

systems. This is easily seen when a direct comparison is made between the clinical manifestations in a case of hyperfunctioning thyroid gland and a case in which there has been a total removal of the gland (Table 1).

TABLE 1

Total Removal of Thyroid (Cachexia Thyreopriva)	Hyperfunction of Thyroid (Graves' Disease)
1. Absence of gland	Swelling of the thyroid gland; hypervascularization of gland.
2. Cold skin, without flushings.	Vasomotor instability.
3. Slow small, regular pulse.	Frequent, tense and at times irregular pulse.
4. Uninterested quiet stare without expression of life.	Anxious, changing glances.
5. Narrow palpebral aperture.	Wide palpebral aperture (exophthalmos).
6. Slow digestion and excretion, poor appetite, requiring little food.	Abundant secretions, excessive appetite with increased need of food.
7. Retarded metabolism.	Increased metabolism.
8. Skin thick, opaque, dry and scaling.	Skin thin, transparent and moist.
9. Short, thick fingers with broad ends.	Long slender fingers with pointed ends.
10. Sleepy.	Wakeful and disturbed sleep.
11. Slow sensation, apperception and action.	Increased sensation, apperception and action.
12. Lack of thoughts, interest and emotion.	Flight of ideas, psychic excitation.
13. Slow, awkward muscular movements.	Constant activity and haste.
14. Stiffness of the extremities.	Tremor and increased mobility of joints.
15. Constant chilliness.	Unbearable feeling of heat.
16. Slow difficult breathing.	Superficial breathing with imperfect inspiratory expansion.
17. Increase of weight.	Loss of weight.

INFLUENCE OF GOITER ON THE HEART

Because of the accelerator effect of the sympathetic nervous system in goiter there is a speeding-up of the cardiac rate (heart hurry) or tachycardia. Tachycardia may be either simple or paroxysmal in type and is often spoken of as palpitation. The minute cardiac output of blood from the heart is increased in direct proportion to the rapidity of the heart beat and it naturally follows that the centripetal circulation, or the rate of flow through the capillaries, is likewise speeded up, resulting in an increased oxidation of the tissues. The general level of blood pressure may be normal, elevated or reduced; but the pulse pressure is almost regularly increased. These changes in pulse rate and pulse pressure roughly parallel the changes in metabolic rate and they doubtlessly depend in part upon the general level of body metabolism. The accidental murmurs heard over the heart, the palpitation and excessive arterial pulsations are all due in part to excessive cardiac activity.

THE SYMPATHETIC NEUROSIS ACCOMPANYING THYROID DISEASE

Palpitation, tachycardia, dyspnea and general muscular weakness are all common and constant symptoms of thyroid disease. These symptoms should not be interpreted as heart signs. Palpitation is a symptom of disturbed sensation. It is a mark of the heightened nervous irritability so characteristic of thyrotoxicosis. Tachycardia or increased rate is merely a physiological adaptation and, like dyspnea, a physiologic response, and partly due to the general muscular weakness and inefficiency of the thyrotoxic organism in doing work.

DECOMPENSATION

Because of the excessive cardiac activity a thyroid heart will eventually become decompensated. The length of time that the heart must carry this added load is in direct proportion to the degree of decompensation. Long-standing cases frequently show evidence of myocardial disease, such as cardiac dilatation and hypertrophy with incidental extrasystoles or auricular fibrillation. Myocardial failure is more frequently noted in the chronic nodular goiter that brings the patients to the doctor after the age of forty than in the acute exophthalmic type.

A decompensated thyroid heart presents the same problem as any other decompensated heart. The signs of decompensation are the same rapid irregular rhythm (fibrillation), enlargement of the liver,

edema of the extremities and general anasarca (ascites and pleural effusions).

Auricular fibrillation is not alone a sign of cardiac decompensation. A heart may fibrillate and still be compensated. This peculiar irregularity is, in most instances, constant, so much so that it has been called the permanent irregularity (P. irregularis perpetuus). As a rule patients who have an auricular fibrillation from mitral stenosis or some other organic heart lesion are oblivious to the irregularity of the fibrillation, but the thyrotoxic patients, because of the heightened nervous irritability, are particularly distressed by the irregular beats and complain quite bitterly of them.

Auricular fibrillation in patients with thyroid disease is more amenable to treatment because it is not usually associated with any organic heart lesion, and when present without any accompanying cardiac decompensation often disappears completely with the elimination of the offending cause, thyroid disease.

PREOPERATIVE TREATMENT

Having decided that the case of a patient with thyroid disease is a surgical one, our problem is to give such treatment as will take the patient through the surgical experience with the least risk. Our preoperative treatment is divided into two classifications:

1. Those cases with compensated heart.
2. Those cases with decompensated heart.

There is no difference in these two types of cases with the exception that digitalis is indicated in those cases with decompensated heart and not in the others. Both types of patients are placed in the hospital and given absolute rest in bed. The patient is not allowed up for any reason. Visitors are excluded and quiet is maintained as much as possible. The patient must be kept happy. The diet consists of nutritious meat-free foods, without tea or coffee, averaging 1500 calories per day. Sedatives that do not contain alcohol are given as necessary for alleviation of excessive nervousness.

Both types of cases receive Lugol's solution of an average dosage of 15 to 20 minims three times a day in water after meals.

This treatment as outlined is used for both classes of patients for a period of one week to ten days prior to surgery. However, those cases with signs of cardiac decompensation are rapidly digitalized.

Table II

PREOPERATIVE TREATMENT

Compensation	Decompensation
Rest in bed	Rest in bed
Sedatives	Sedatives
Lugol's solution	Lugol's solution
No digitalis	*Complete digitalization*

Quinidine Sulphate for Fibrillation.

DIGITALIS

It makes little difference in what form digitalis is administered; providing the preparation is potent and in a sufficient amount, digitalis effects may be confidently expected. It should be remembered that the tincture rapidly loses potency. The glucosides are soon reduced to inert sugars by exposure to light and air, so that the tincture should be freshly prepared if its potency is to be depended upon. The part of wisdom is to use few preparations and to obtain them from the same source. The powdered dried leaves are perhaps the preparation of choice.

Only rarely is there a true need of introducing digitalis otherwise than by mouth as it has been shown that where given in sufficient dosage a therapeutic effect may be observed in five or six hours and the maximum in twelve or eighteen hours.

Pardee found that the average individual disposes of about 22 minims of the tincture per day or the equivalent to 2.2 grains of the powdered leaf. Keeping this in mind the danger of the cumulative action of digitalis has certainly been overemphasized. Cushny has aptly compared the administration of digitalis in massive dosage to a

simple chemical titration in the laboratory. Where the strength of the reagent is known, it is safe to run in from the burette a relatively large quantity of salt, and then complete the reaction with a few drops as the end point is reached. If we obtain the desired result the dosage is adequate and further use of the drug is contraindicated.

Digitalis will not control a tachycardia and has been frequently maligned because it failed to do so. Lugol's solution is by far the better therapy. If however, the patient has evidence of cardiac failure, digitalis should be employed in exactly the same fashion as a preoperative measure as it would be in the treatment of cardiac failure without an operation looming upon the horizon.

There appears to be no justification for the routine employment of digitalis in patients with normal hearts before operation.

The Eggleston method of dosage and administration of digitalis has become standard and we can do no better than adhere closely to the rules as originally laid down by him. A rough easy modification of Eggleston's method is 0.2 grain or 0.01 gram of the powdered leaf per pound of body weight of the patient, and for the tincture ten times the same dose in cubic centimeters. This gives the theoretical total amount which a heart requires for complete digitalization within safe limits.

METHOD OF ADMINISTRATION OF CALCULATED AMOUNTS

1. When a patient has received no digitalis within ten days:

Six hours apart	1st dose:	$\frac{1}{3}$–$\frac{1}{2}$ of total amount
	2nd dose:	$\frac{1}{5}$–$\frac{1}{4}$ of total amount
	3rd dose:	$\frac{1}{8}$–$\frac{1}{6}$ of total amount

Then $\frac{1}{10}$ total amount three times daily until digitalization is complete.

2. If patient has been receiving digitalis in preceding ten days the total calculated dosage should be reduced, the amount of digitalis retained allowing an average of 2.2 grains excreted per day. If this cannot be done then the total dosage is reduced to 75 per cent and the procedure already given is followed.

TIME TO OPERATE

When all signs of decompensation have disappeared, usually seven to ten days after complete digitalization, surgical treatment should be instituted. To wait at this time will again subject the heart to those influences that caused the original decompensation i.e. thyroid dysfunction.

Quinidine sulphate is often invaluable in controlling the fibrillation in these cases where no decompensation is present or after the heart has become compensated.

SUMMARY

1. Surgeons should be associated with a cardiologist in the preoperative treatment of thyroid heart conditions.

2. The "thyroid heart" is a functional disturbance and cannot be cured unless the causative agent, thyroid disease, is eliminated.

3. Thyroid hearts eventually become decompensated.

4. Palpitation, tachycardia, dyspnea and general muscular weakness are not heart signs but are only evidences of the sympathetic neurosis accompanying thyroid disease.

5. A decompensated thyroid heart presents the same problem as any other decompensated heart.

6. Digitalis is of value only in the presence of a decompensation and is not used otherwise.

7. Digitalization should be quick and complete.

8. Digitalis is invaluable in lessening the cardiac output prior to operation and may be the deciding factor in the patient's recovery.

9. Operation must not be delayed after compensation has been restored.

SPLENECTOMY FOR THROMBOCYTOPENIC PURPURA HEMORRHAGICA

WITH CASE REPORTS*

HENRY F. GRAHAM, M.D., F.A.C.S.

BROOKLYN, N. Y.

THROMBOCYTOPENIC purpura hemorrhagica is characterized by:

1. A marked decrease in the blood platelets.
2. Normal coagulation time.
3. Prolonged bleeding time.
4. Absence of retraction of the blood clot.
5. Changes in the capillaries, and possibly the whole reticuloendothelial system.

The red and white cells are normal in character.

This disease is not hereditary, but it occurs most often in youth, from three and one-half years up. The bleeding may occur anywhere in the body, beneath the skin or mucous membranes, or from the vagina, rectum, or other orifices. The tendency to bleed is often well shown in these patients by the tourniquet test. Sufficient pressure in the blood pressure cuff to obliterate the venous flow but not the arterial, causes petechial hemorrhages.

The blood platelets originate from the megacaryocytes of the bone marrow and furnish a substance called thromboplastin which hastens coagulation.

There are various theories as to the cause of the disease:

1. That it is primary in the bone marrow and due to defective formation of platelets. If this is correct, why is there such a large and sudden increase in the platelets after splenectomy?
2. That the normal platelets are destroyed by a toxin in the blood.
3. That normal platelets are destroyed in the spleen.

The consensus of opinion of those who have studied the disease seems to be that the platelets are probably formed in normal numbers but are destroyed by the spleen and the reticuloendothelial system. The capillaries also are altered so as to become more permeable, probably by a toxin.

Splenectomy has effected a cure in a considerable percentage of cases. It was first performed in 1916 by Kaznelson.

Whipple collected 81 cases. Of these, 73 were chronic. There were 6 deaths. Eight were acute with 1 death. Later reports from 61 showed that there were 51 good results, 4 fair results, and only 6 poor results; i.e. about 90 per cent were successful.

The fact remains that a few cases are not cured and splenectomy causes practically no rise in the platelets in some cases.

Morrison, Lederer and Fradkin report a case where an accessory spleen was seen but not removed at operation and a cure was not obtained. This may explain other failures.

Accessory spleens are commonly seen in the autopsy room and should be searched for at operation upon these cases of thrombocytopenic purpura. In the case about to be reported such an accessory spleen was found and removed.

The cases where an enlarged spleen is removed seem to do better than others.

Kaznelson early noted that, of 4 cases observed, 3 had an enlarged spleen.

In considering the advisability of splenectomy and the operative risk to be incurred, one must not forget that the disease itself at times proves fatal.

Hamilton and Waugh report a case that died with symptoms of intracranial hemorrhage within three months of the first hospital admission. The previous duration of the disease was not stated. Another fatal case is appended.

* Read before the Brooklyn Surgical Society, January 2, 1930.

Splenectomy, in normal individuals free from purpura, is followed usually by a marked increase in the platelets.

Most writers agree on the danger of splenectomy in the acute form and the unsatisfactory after-results in many cases, although Killins has reported an acute case with operation upon the sixth day and complete recovery.

The following case is one of thrombocytopenic purpura cured by splenectomy:

Case 1. K. S. Hospital No. 128190. First surgical service, Methodist Episcopal Hospital.

Age, sixteen. Female. Born in U. S. Student Family physician, Dr. H. L. Hall.

Admitted to hospital August 4, 1928. Discharged August 23, 1928.

Past History: She has generally had good health but has had measles and pertussis and had trachoma eleven years ago. Her thyroid gland was somewhat enlarged at fifteen years. Her menstrual periods started at twelve years, have come every twenty-eight days, and lasted four days. The flow has been moderate. There have been no clots and no pain in the past.

Family History: Father and mother are living and well. There was no history of bleeding in other members of the family.

Present Illness: This started twelve days ago with bleeding from the uterus. This blood was bright red in color and about normal in amount for the regular period which was then due. After four or five days, when the flow should have ceased, it continued unabated and contained large dark clots. The patient became increasingly weak and had four fainting spells, the last of which was upon the morning of admission.

The patient has always developed black and blue marks from even slight trauma from childhood up, and her hands and arms show such spots at the present time. Ergot has been taken by mouth for a few days and seemed to lessen the flow about one quarter.

Physical Examination: This shows a rather stout girl in an extremely weak condition and with great pallor of her lips and mucous membranes. Blood is coming from the vagina, and there are hemorrhagic spots on her hands and arms.

For vaginal examination, see record of curettage.

Date	8/4/28	8/9/28	8/10/28*	8/14/28	8/22/28	4/16/29
Red cells	2,400,000	.....	3,200,000	4,040,000	4,544,000	2,050,000
Hemoglobin (per cent)	25	.....	36	53	70	18
White cells	6,400	.....	11,000	8,450	6,200	8,400
Platelets	.....	30,000	40,000	.....	80,000	136,000
Polynuclear neutrophiles (per cent)	68	.....	65	70	73	75
Polynuclear eosinophiles (per cent)	.....	.....	2	10		
Myelocytes (per cent)	.....	.....	10	10		
Small mononuclears (per cent)	32	.....	26	28	25	23
Large mononuclears (per cent)	.....	.....	60	.....	20	20
Normoblasts	.....	.....	2 per 100 WBC	.....	Occasional	Few
Coagulation time (min.)	3½	.....	.....	.....	.....	3½
Bleeding time (min.)	.....	.....	Over 16	.....	.....	Over 17
Tourniquet test	.....	.....	Slightly positive			

An admission blood count showed 2,400,000 red cells, 25 per cent hemoglobin, 6,400 leucocytes, 88 per cent polynuclears, and 32 per cent lymphocytes. The coagulation time was three and one-half minutes. The patient was Type III for transfusion.

A transfusion of 1,000 c.c. was given on the day of admission by the direct Unger method, by Dr. H. W. Mayes. Following this, the blood count rose to 3,136,000 red cells and 48 per cent hemoglobin. The bleeding from the uterus continued, however, and two days later, August 6, 1928, Dr. Mayes performed a dilatation and curettage. The uterus was found enlarged to the size of a two-months' pregnancy, but the curettage failed to yield any gross material, and microscopical examination showed

nothing but blood clot. The uterus was packed.

For two days following this operation, there was practically no bleeding, but, as soon as the packing was removed, the flow commenced again.

A blood count on August 9, 1928, did not show a great drop, but the platelet count at this time showed only 30,000 platelets. This was repeated the following day and gave 40,000 platelets. A smear at this time showed slight pallor of the erythrocytes and moderate anisocytosis and slight poikilocytosis with an occasional rare normoblast, i.e., 2 normoblasts to every 100 W.B.C. counted.

The blood pressure was 112/70. The bleeding time was over sixteen minutes. The tourniquet test was slightly positive.

A consultation was held with Dr. N. Rosenthal, hematologist of Mt. Sinai Hospital. He confirmed the diagnosis of chronic purpura hemorrhagica and stated that the blood picture was typical of thrombocytopenic purpura hemorrhagica. He advised splenectomy if transfusions failed to arrest the menorrhagia.

On August 11, 1928, another transfusion of 600 c.c. was given. Following this the bleeding gradually ceased, and the patient returned home.

On April 13, 1929, the patient again returned to the hospital. Four months previous to admission, she had a profuse period of longer duration than usual. The two succeeding periods were also increasingly long and profuse, and she had been suffering from uterine bleeding for a month preceding her admission. Her pulse was 120 and blood pressure 105/50.

A transfusion of 540 c.c. was given on April 14, 1929, and following this, the right arm bled for three hours. The bleeding was finally stopped by thromboplastin. The blood count was 2,050,000 red cells, 20 per cent hemoglobin, 8,400 leucocytes, and 79 per cent polynuclears with 21 per cent monouclears; later there was an occasional nucleated red cell.

The platelet count on April 16, 1929 was 136,000. A second transfusion on April 17, of 760 c.c. brought the blood count up to 3,040,000 red cells and 27 per cent hemoglobin. The platelets dropped to 119,000. Even after these two transfusions, the bleeding time was over seventeen minutes, although the coagulation time was only three and one half minutes.

Dr. Rosenthal, at another consultation, advised a splenectomy.

On April 22, 1929 a transfusion of 900 c.c. was given by Dr. Seymour Clark who left the vein exposed at the close of the transfusion.

A splenectomy was then performed (Henry F. Graham) through an upper left rectus, hockey-stick incision. The spleen measured 15 × 11 × 4½ cm. It was soft and composed of glandular tissue throughout. Microscopical sections showed a marked proliferation of the reticuloendothelial cells. There were large areas where these cells had completely replaced the lymphoid tissue. There was a short main pedicle and a larger accessory pedicle deeply placed at the upper pole. A small accessory spleen was found in the neighborhood. This was also removed.

At the close of this operation, Dr. Clark introduced 700 c.c. of blood from another donor directly into the same vein. The patient

Date	4/19/29	4/23/29	4/26/29	4/29/29	5/17/29	8/5/29
Red cells	3,040,000	3,270,000	.....	.....	4,330,000	4,208,000
Hemoglobin (per cent)	27	28	.....	.....	47	75
White cells	7,450	.....	.....	.....	5,900	11,900
Platelets	119,000	136,000	310,000	298,000	332,000	
Polynuclear neutrophiles (per cent)	69	.....	.....	54	54	78
Polynuclear eosinophiles (per cent)						
Myelocytes (per cent)	1	.....	.....	.....	.....	Transitional 2
Small mononuclears (per cent)	30	.....	.....	46	46	11
Large mononuclears (per cent)	.....	.....	.....	.....	.....	9
Normoblasts						
Coagulation time (min.)	.....	.....	3½	.....	.....	2
Bleeding time (min.)	.....	.....	2½	.....	.....	1½
Tourniquet test						

* Dr. Rosenthal.

left the table in good condition. The following day the red cells were 3,270,000, hemoglobin 28 per cent platelets 136,000.

The highest postoperative temperature was 102°F. A gastric lavage was done on the day following operation because of vomiting, but only clear fluid was obtained.

The bleeding from the vagina continued following operation, but on the third day became less, and on the fourth day there was no vaginal bleeding. It had ceased and did not recur while the patient was in the hospital. There was primary union in the operative wound.

On April 26, the platelet cound was 310,000, coagulation time three and one half minutes, bleeding time two and one half minutes. On April 29, it was 298,000, and the red cells were 3,450,000 with a hemoglobin of 35 per cent. May 4, the platelets were 306,000, red cells 3,580,000, hemoglobin 38 per cent. May 17, platelets were 332,000, hemoglobin 47 per cent.

Patient discharged as recovered on May 19, 1929.

On August 5, her weight was 209, red cells 4,208,000, hemoglobin 75 per cent, leucocytes 11,900, polynuclears 78 per cent, small lymphocytes 11 per cent, large lymphocytes 9 per cent, transitionals 2 per cent, coagulation time two minutes, bleeding time one and one half minutes, platelets 536,000.

This patient has been seen several times since her discharge from the hospital. The last time was Sept. 4, 1929. She has remained well. Her periods are now normal.

A second case of thrombocytopenic purpura was found in our hospital files.

Case II. No. 116999. Female, eighteen years. Admitted, February 10, 1927. She was bleeding from the gums, lips, nose and vagina, and this had persisted off and on for eight months since the birth of a child. The vaginal bleeding had lasted a month, and there were petechiae under the skin and an enlarged spleen. The hemoglobin was 17 per cent, and the red cells were 1,450,000. The coagulation time was four and one half minutes. The platelets, on two counts, were 60,000 and 28,000. The bleeding time was not taken. She bled from the rectum and stomach and died February 24, 1927 in spite of a transfusion.

Differential diagnosis should exclude hemorrhagic purpura not of the thrombocytopenic type.

An interesting case illustrating this was seen at the Norwegian Hospital:

Case III. M. S. No. 25109. Thirty-five years. Admitted May 6, 1927.

An operation was performed consisting of an appendectomy, cholecystectomy, trachelorrhaphy, and perineorrhaphy. On May 19, nine days later, she began to bleed from the perineum, and this was resutured without result. Further history revealed that her father was a bleeder and that she once bled profusely after labor.

The blood came steadily in a slow stream from her vagina until she became pulseless and unconscious. A telephone consultation with Doctor Ottenberg gave us a tentative diagnosis of purpura hemorrhagica and the advice that massive transfusion was indicated. Two donors were used in succession and 1480 c.c. of blood given, with recovery. Two later transfusions, amounting to 1730 c.c., brought the total used in four days to 3210 c.c. The platelet count was 1:8 on May 23 and 1:10 on May 26, totaling 266,000. The lowest red cell count was 2,710,000 with 40 per cent hemoglobin, polynuclears 84 per cent, lymphocytes 16 per cent, white cell total 11,600.

An interesting case illustrating one of the problems in differential diagnosis is the following one of aleucemic leucemia.

Case IV. No. 121922 December 4, 1927.

The patient was a female aged forty-nine, showing multiple ecchymoses of the skin and mucous membranes. The red cell count was 3,800,000, hemoglobin 70 per cent. The platelets varied between 30,000 to 105,000 on the day following transfusion. The white cells were 4,000, the polynuclears 22 per cent, the lymphocytes 78 per cent, coagulation time six and one half minutes, bleeding time five minutes.

Discharged December 18, 1927 as improved.

The diagnosis was made by Dr. N. Rosenthal. A low total white count and a high differential lymphocyte count, with many immature forms, characterizes this condition.

Hemophilia gives a family history, being transmitted through the female with active bleeding in the male. The coagulation time is much prolonged. The bleeding time is often diminished. The platelet count is normal.

[Note: For bibliography see author's reprints.]

AMEBIC ABSCESS OF THE LIVER*

METHOD OF TREATMENT

INJECTION OF CAVITY WITH IODIZED OIL FOR DEFINITE LOCALIZATION

CLIFFORD LEE WILMOTH, M.D., F.A.C.S.

BALTIMORE, MD.

ABSCESS of the liver is one of the most serious complications or sequelae of endameba histolitica infection of the intestinal tract. Although involvement is seen much more frequently in tropical countries, the condition is by no means uncommon in temperate countries.

The chances of recovery in amebic abscess of the liver depend to some extent upon the stage of the disease when first diagnosed, the site and size of the abscess, and whether multiple or single. Of more importance, however, is the method of treatment to be followed, as demonstrated in recent statistics which show that the mortality has dropped from a tremendous height to below 5 per cent.

It is interesting to note that only a few years ago one of America's foremost surgeons of today wrote in a Practice of Surgery the following: "Aspiration as a curative measure combined with siphon drainage has been recommended by some. It is unsurgical, and even as a diagnostic procedure should not be resorted to until one is quite ready to proceed with the operation. Puncture of the liver for the purpose of locating pus should not be made until after the abdomen or the thorax has been opened, and as regards multiple abscesses little can be hoped for from surgical treatment."

What then is the reason for the drop in the mortality rate aside from the use of emetine? It is the general adoption of that "unsurgical" instrument, the aspirating needle, for diagnosis and treatment.

Sir Leonard Rogers states, "there is probably no serious tropical disease in which so much advance has been made during the last quarter of a century both in prevention and cure as in amebic hepatitis and its sequel, if not urgently and efficiently treated, liver abscess. The aspiration and emetine treatment is now in general use and the open operation is to all intents and purposes obsolete except under unusual conditions."

Notwithstanding the convincing small fatality rate of those using the aspiration and emetine method, it may still be stated that there are 3 recognized methods of treatment in amebic infection of the liver: (1) medicinal, with intramuscular injections of emetine hydrochloride, to be followed by oral administration of ipecacuanha; (2) aspiration of the abscess one or more times, plus emetine hydrochloride intramuscularly and ipecacuanha orally; (3) incision and drainage of the abscess plus emetine hydrochloride and ipecacuanha.

There are those who believe that aspiration or incision and drainage are quite unnecessary in the majority of patients with hepatic involvement and that emetine injections and ipecac orally are not only sufficient in the presuppurative stage, but also in definitely developed abscess. While no doubt exists as to the efficiency of emetine alone in hepatic involvement, yet it is evident that convalescence is hastened and serious sequelae may be prevented by the addition of operative measures. When once an abscess has developed, convalescence will be greatly hastened by relieving the patient of the more or less toxic abscess fluid, which would otherwise be slowly absorbed or encysted.

While no doubt exists that large abscesses do disappear quite rapidly following emetine injections in patients who have refused operation, yet such routine methods of treatment should not be considered proper. It would seem better to reserve

* From the Surgical Service, U. S. Marine Hospital, Baltimore, Md. Submitted for publication November 7, 1929.

the medical treatment, so-called, for the patient who comes for treatment while the hepatic involvement is still in the presuppurative stage or for the patient with multiple small abscesses where open operation and drainage are hopeless as regards satisfactory drainage. The early recognition of a presuppurative amebic hepatitis is imperative if later suppuration is to be avoided by the use of emetine and epecacuanha.

The success of operative treatment of amebic abscess of the liver depends upon the ability to bind the abscess or abscesses and to remove the contents either by aspiration or by incision and drainage.

Even after aspiration has been successfully done once, there may be considerable difficulty in finding again the abscess cavity for subsequent aspiration although one may have a general idea of the depth and the relative direction in which the needle first found amebic pus. The use of some opaque substance for injection into the cavity following aspiration of the amebic pus before altering the position of the needle, and subsequent radiographic examination of the liver region in two planes, establishes quite satisfactorily the position of the abscess for future operative procedures.

The accompanying radiographs illustrate a liver abscess localized by injection of iodized oil. Following aspiration of four and a half ounces of chocolate amebic pus, one ounce of iodized oil was injected into the partially collapsed abscess cavity through the aspirating needle. Radiographs were then immediately made in the anterior-posterior and the lateral views. Radiographs repeated two days later showed almost complete disappearance of the iodized oil, apparently due to absorption.

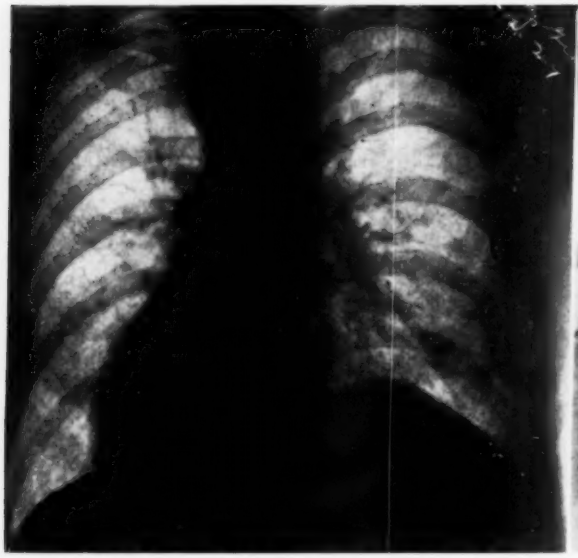


FIG. 1. Amebic abscess of liver previous to aspiration. Definite pointing of abscess.

FIG. 2. Amebic abscess of liver after aspirating 4½ oz. of pus and injecting 1 oz. of lipiodol. Anteroposterior and lateral views localize position of abscess quite satisfactorily for further aspiration or for incision and drainage.

Aspiration, singly or repeated, plus the intramuscular injections of emetine, offers the most satisfactory results and is a life-saving procedure. Under such treatment the mortality has been reduced from far above fifty per cent to less than five per cent. Chatterji has even reduced his fatality statistics in 186 cases to less than two per cent, by the general adoption of the aspiration and emetine method of treatment.

The average patient with amebic abscess of the liver is in an exhausted condition and cannot bear well the shock of an open operation. Aspiration on the other hand usually can be done under a local anesthe-

sia and is relatively free from shock. The absence of shock following aspiration accounts for a large percentage of the decrease in the fatality rate, but also to be considered is the avoidance of a prolonged convalescence due to prolonged suppuration which is exhausting and increases the mortality in those who have stood the shock of open operation.

Fig. 3. Lateral view showing abscess after injection of 1 oz. of iodized oil into cavity. Its position in relation to sternum and vertebrae is definitely outlined.

Since between 80 and 90 per cent of amebic abscesses are sterile as far as pyogenic organisms are concerned, aspiration gives little chance for secondary infection, although secondary infection is practically unavoidable following an open operation and drainage. It should be remembered that a large amebic abscess of the liver offers a favorable medium and optimum temperature for the growth of organisms is introduced by the aspirating needle or subsequent to incision and drainage.

The treatment of amebic abscess should differ little from that given tuberculous abscesses elsewhere. In both conditions one expects to find an abscess fluid sterile as far as pyogenic organisms are concerned. And in both conditions, aspiration will be of benefit while incisions with drainage will certainly result in secondary infection and prolonged suppuration.

Fig. 4. Drainage of liver abscess by anterior incision. Immediate results satisfactory but hernia in epigastric region followed and dense adherent scar formed between abdominal wall and anterior surface of liver, over an area 4 in. in diameter.

The open operation, that is, incision and drainage, has a definite place in selected cases of amebic abscess. If cultures of aspirated pus show pyogenic organisms, incision and drainage will probably be found necessary. If in spite of repeated aspirations the temperature remains septic, and the leucocyte count remains high, incision and drainage may be the only procedure which offers hope. The location of the abscess may determine the method to be followed. Open operation may be indicated in abscesses of the left lobe of the liver and in those of the epigastric region because of the danger of injury to large vessels or abdominal viscera from attempted aspiration without incision. Open operation is also indicated when rupture of the abscess occurs into the pleural or peritoneal cavity and secondary infection occurs. The indications for open operation are as follows: Those

patients showing continuation of acute symptoms which have not been relieved by aspiration plus emetine should have the benefit of an open exploratory incision, although it should be carefully considered that the immediate shock will be severe, and that secondary infection will probably result, that convalesence will be prolonged and that the subsequent exhaustion will carry off some who were able to withstand the shock of the operation. The open operation should be necessary in exceptional cases, as statistics show that the abscess will be found in the right lobe in over 80 per cent of cases, in which case the abscess can be aspirated safely with the aspirating needle.

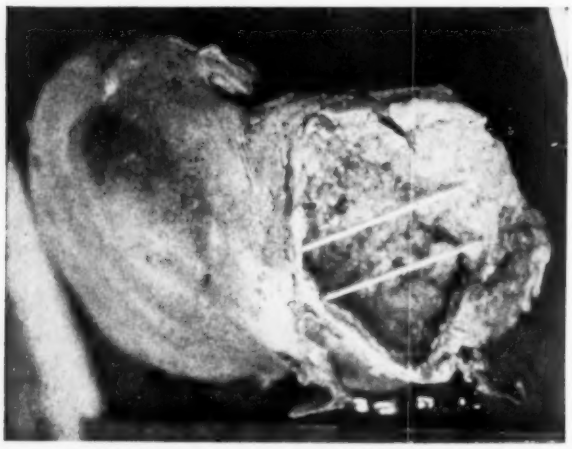


Fig. 5. Amebic abscess of liver due to entameba histolytica. Abscess involved entire left lobe of liver with hardly more than liver capsule about it. Patient died of suppurative pericarditis due to direct extension or to small rupture through pericardium. At post-mortem examination no rupture could be found.

The signs and symptoms may give definite indications of suppuration and definite signs of localization. Frequently however suppuration is present without certain evidence of localization. The diagnosis must be confirmed and the first treatment rendered by the aspirating needle. The importance of a thorough knowledge of the anatomy in the normal, as well as a visualization of the altered anatomical relations resulting from the hepatitis, must be kept in mind. The point at which the aspirating needle is inserted depends upon the probable location as determined by the localization of pain and tenderness and by signs of localization as revealed by the roentgen ray picture. If no localizing signs can be found the needle should be inserted in the eighth or ninth intercostal space of the right side and at least five regions of the right lobe explored before giving a negative report. This should be repeated a few days later if the symptoms continue. It is seldom necessary to have a needle longer than four inches, and except in a large individual, the insertion of a needle deeper than four and a half inches carries with it a risk of injury to important structures. Infiltration anesthesia is needed only for the chest or abdominal wall as the patient experiences very little pain when the liver itself is punctured.

When the abscess is located, aspiration may be done with a large glass syringe, by a Potain aspirator or by connecting the needle to a rubber tube running to a water pump or other suction apparatus. While some advise the injection or irrigation of the abscess cavity with quinine or emetine solution, there seems to be no indications for such procedures.

If open operation seems indicated the position of the abscess determines the site of incision. If localized in the right lobe it is accessible by the transpleural route, with or without rib resection. If the signs and symptoms point to suppuration in the left lobe or near the midline, a median incision will give the safest and best exposure.

Whether repeated aspirations or aspiration followed later by incision and drainage is the method of treatment decided upon, the definite localization of the abscess cavity by injection of iodized oil is a valuable aid for future use and may be a time-saving and shock-preventing measure. It is evident from observations made possible from the injection of the iodized oil, that collapse of the cavity apparently occurs as the pus is aspirated. Figure 1 shows a cavity now only large enough to contain approximately 1 ounce, which originally held only a few moments before 4½ ounces. This collapse is probably due to the formation of a vacuum

as the pus is withdrawn, with resulting diminution in the size of the cavity. This would probably not occur in open operation. Rapidity of absorption from the abscess cavity was determined by the repetition of *x*-ray pictures forty-eight hours later. After forty-eight hours only a small indefinite shadow remained to show the position of the ounce of iodized oil which had been injected, the remainder of the oil, to all appearances, having been removed by the hepatic ducts.

Whatever operative procedure is determined upon, the necessity for intramuscular injections of emetine hydrochloride in one grain doses before and during convalescence is essential. Daily intramuscular injections of emetine in one grain doses for the first ten days, half grain injections for four more days and one grain injections at weekly intervals for four more weeks with careful observations for evidences of toxicity, should result in continued improvement. While there may be some danger of emetine poisoning, amebic abscess of the liver is a dangerous condition and requires the administration of the emetine to the upper limits of safety. Ipecacuanha orally should be administered. Emetine bismuth iodide or other preparations of ipecac may be found less disagreeable by the patient following the administration of emetine and after the acute stage is past. Strovarsol, treparsol, yatren and other preparations have found favor with some and may be useful in resistant cases.

Recurrences of amebiasis and of hepatic abscess are common. The absence of ameba or of cysts in the stools is not sufficient evidence of complete recovery. There is no more reason to hope that a case of long-standing amebic infection is cured by one course of emetine than that a case of long-standing syphilis is cured by one course of antiluetic treatment. The repetition of courses of emetine hydrochloride in 1 grain doses intramuscularly or ipecac in 30 to 40 grain doses orally is of importance at intervals over a period of months, if future hepatic and intestinal symptoms are to be prevented; just as in syphilis a small percentage of patients will be found in whom the treatment has no lasting benefit and where relapses will occur.

SUMMARY

In amebic abscess of the liver the two procedures, emetine without drainage, and incision and drainage, have a definite place in a small percentage of cases, yet the routine adoption of aspiration plus emetine, unless contradictions are present, is the most satisfactory method both from the surgeon's and the patient's viewpoint, and is a life-saving procedure.

The use of iodized oil for injection into the amebic cavity immediately following aspiration definitely localizes the abscess, giving its relations to other anatomical parts and making later aspiration or later incision and drainage much easier. The importance of immediate roentgen-rays in two planes must be emphasized, as the iodized oil may not be visible after forty-eight hours.

It is important that emetine and ipecac not only be given during the acute stage, but during and following convalescence if recurrences are to be avoided. The absence of ameba or cysts in the stools cannot be taken as an index of cure in hepatic involvement of the liver, and treatment should be continued at intervals over a period of months.

REFERENCES

Chatterji, K. K. Surgical aspects of amoebiasis. *Indian Med. Gaz.*, 52: 333, 1922.

Idem. Tropical Surgery and Surgical Pathology. N. Y. Wood, 1927.

Fry, A. S. Spontaneous absorption of amoebic abscess of the liver under emetine therapy. *Indian M. Gaz.* p. 488, 1924.

Hayes, S. N. Treatment of hepatic abscesses of amoebic origin. *Indian M. Gaz.* 62: 13, 1927.

Ludlow, A. I. Liver abscess. *Surg., Gynec. Obst.* 36: 336, 1923.

Idem. Amoebic liver abscess. *China M. J.* 40: 1165, 1926.

Neligan, A. R. Treatment of liver abscess by aspiration. *Lancet*, 2: 1398, 1923.

Rogers, Sir L. Amebic liver abscess, its pathology, prevention and cure. *Lancet*, pp. 463–569, 1922.

Idem. Recent advances in tropical medicine. Lond., Blakiston, 1928.

Thurston, E. O. Liver abscess. *Lancet*, 2: 1008, 1924.

EARLY SYMPTOMS AND DIAGNOSIS OF CANCER OF THE GENITOURINARY ORGANS*

ARCHIE L. DEAN, JR., M.D.

NEW YORK

KIDNEY

ADENOCARCINOMA or hypernephroma, the most common malignant tumor of the kidney, is rarely diagnosed early. Patients remain in ignorance of their condition for long periods because of the remarkably "silent" nature of the dissease. Though the growth may be developing steadily, the excretory function of the kidneys may continue undiminished for years. Relative inaccessibility of the organs prevents a prompt recognition of an early alteration of form.

Sooner or later, however, in the great majority of cases the renal pelvis is invaded, and when ulceration takes place hematuria follows. This is the first symptom in about 85 per cent of all cases. It is at this time that the true nature of the disease should be discovered.

The initial symptom in other cases may be (1) pain in the kidney region; (2) discovery by the patient of a large tumor on one side of the abdomen; (3) loss of weight and strength; (4) discomfort caused by metastases.

Hematuria in these cases may be painless, associated with no localizing sensations. Often however, when blood clots form, there is spasm of the ureter of the affected side and the symptoms simulate those of a ureteral calculus in passage. Again, if a clot occludes a ureter, dilatation of the renal pelvis causes a characteristic unilateral pain in the flank. As relief follows promptly when the clot is evacuated into the bladder, hydronephrosis may be suspected. A clue is furnished if a pipe-like clot, formed in the uterer lumen, maintains its integrity after passage through the urethra.

The usual patient is an elderly person in depreciated general health. Palpation of the abdomen reveals frequently an enlarged kidney. This finding is substantiated when a roentgenological examination is made in search of demonstrable calculi.

A careful cystoscopic examination is necessary in all cases. Even when the diagnosis can be made on the basis of an enlarged kidney in a patient suffering with hematuria, one should employ the cystoscope to learn the functional capacity of the sound organ. A common problem is presented by those patients who complain of hematuria without any localizing symptoms or signs.

Cystoscopy reveals usually a normal bladder and trigone. Occasionally this cannot be demonstrated until after the evacuation of blood clots. In rare instances the tumor sends an extension down the ureter without involving its walls. If this projects from the ureteral meatus it may be visualized as a pale, cylindrical protrusion. Should the patient be bleeding at the time, the task of the examiner is simplified because red jets will be seen issuing from the ureter of the affected side. Gentle catheterization of the ureter should be performed and specimens of urine collected from each kidney. Finding a few red cells blood is of no moment, but it is significant if trauma by the catheter causes appreciable hemorrhage, or if there is unilateral pyuria or subnormal urea output. It should be born in mind that renal calculi and hydronephrosis may coexist with a tumor, and that a bloody urine observed spurting from a ureteral meatus may contain pus cells from a tuberculous infection.

Searching the stained sediment after centrifugalization for tumor cells is fascinating but frought with diagnostic pitfalls.

* From the Department of Urology, the Memorial Hospital, New York. Read before the Section of Genito-Urinary Surgery, New York Academy of Medicine, November 21, 1928.

Positive findings by even the most expert cytologist may be erroneous. The writer needlessly removed a kidney, the source of slight bleeding, because tumor cells had been found in the stained sediment. All precautions had been taken to avoid error. The catheters had never been used previously and the report was given by a pathologist of eminence. Serial sections of the kidney were required to demonstrate a tiny area of adenoma of the lowest grade of malignancy.

The excretory function of the kidneys should be studied individually after the intravenous injection of phenolsulphonephthalein. Early in the course of the disease there is no diminution in dye output. Somewhat later the output of the affected organ is decreased. Total output usually is normal because the sound kidney increases in function as rapidly as disease destroys its mate.

The pyelogram furnishes data of the greatest diagnostic value. The natural tendency of adenocarcinoma of the kidney is to invade the pelvis. For this reason the pyelogram shows a filling defect of greater or less degree in most cases. Early there may be nothing more than a distorsion of the pelvic outline. Later, tumor tissue fills the pelvis, in some cases so completely that the contrast medium can be distinguished only when the roentgen rays strike the fluid tangentially.

After the renal tumor has been revealed roentgenograms should be employed in a careful search for metastases. These occur most frequently in the lungs, long bones, especially of the lower extremities, and bony pelvis. From a point of origin in the medulla the metastasis develops relatively rapidly and with remarkable invasive qualities. Its extension is characterized by complete bone destruction. If the end of a long bone is involved, the process may extend into the joint and through it, involving adjacent bones and even soft parts by direct extension. Metastasis to the lungs through the blood stream gives the roentgenological features noted in metastases from osteogenic sarcoma.

BLADDER

The symptoms of carcinoma of the bladder are usually well marked though not specific in this disease. More than 80 per cent of our patients were performing their usual duties with no premonition of illness when they were startled by the knowledge that they were voiding bloody urine.

No one can emphasize the fact too thoroughly that the symptom of hematuria is positive evidence of organic disease somewhere in the genitourinary system. In every case all proper diagnostic measures should be persisted in until the source of the hemorrhage has been discovered. With competent urologists available to nearly all, a physician assumes an unjustifiable responsibility in prescribing a urinary antiseptic and a period of observation. Only too often the hematuria stops promptly, the patient becomes reassured, but the cancer continues its development.

Coincident with hematuria in some cases, later in the majority urinary frequency is noticed. Before long dysuria sets in.

This sequence of symptoms occurs because the tumor originates in the bladder, most frequently at the base, and continues to develop until its growth at some point outstrips its blood supply. Necrosis destroys the integrity of a vessel wall and hemorrhage follows. In the neighborhood of a growing tumor the bladder wall at first is congested. Later it becomes infiltrated by inflammation or cancer. These changes decrease the bladder capacity and heighten its irritability. The earliest pain in the bladder may be caused by infiltration of its wall, infection, or obstruction by blood clots or tumor. At first the pain is noted only when the bladder contracts during micturition.

In a number of cases frequency and dysuria precede the appearance of blood. When this occurs the tumor is found in the neighborhood of the bladder neck. On account of the greater sensitivity of this region, infiltration causes symptoms of irritation to arise before the tumor breaks down and bleeds.

It is not within the scope of this paper to consider the symptoms associated with the more advanced disease.

In the examination of a patient the act of micturition should be observed closely. In this way information may be gained as to the degree of obstruction, the intensity of dysuria, the amount of hematuria, the period at which these are at their maximum, and the capacity of the bladder. If the odor of the urine is characteristic of putrefaction, we know that necrosis is taking place. The urine is referred to the laboratory for a complete analysis. However, all of these factors are of secondary importance and of no specific diagnostic value. The bladder base is palpated by rectal or vaginal examination in order to learn whether or not the bladder wall has become infiltrated. Occasionally bimanual touch can detect pericystitis or extension of the tumor into the pelvis.

In practically all cases it is through use of the cystoscope that definite and detailed information is gained. With many patients a cystoscopic examination is difficult. Nevertheless if spinal anesthesia is employed to render the operation painless, and suprarenalin be added to the irrigating fluid to diminish bleeding, a good view of the interior of the bladder may be obtained. Perhaps the most valuable factor in the prevention of hemorrhage is gentle manipulation of the instrument. The amount of residual urine liberated by the cystoscope is a measure of the obstruction at the vesical neck.

The tumor may be either papillary or flat. The usual picture is that of a cauliflower-like projection into the bladder cavity from some part of the bladder base. The lower third of the lateral walls is involved frequently by direct extension. The tumors are single or multiple, and of almost any size. In general configuration a simple papilloma is an elongated process with elongated, pointed villi, growing from a relatively small base. In contrast, the papillary carcinoma is a rounded tumor, the individual villi of which are rounded or club shaped. The base is broad. In addition, the mucous membrane shows a considerable degree of inflammatory reaction in the neighborhood of carcinoma. Surrounding the tumor base there is usually a zone of bullous edema. This subsides through the various phases of congestion as the distance from the tumor increases. Most papillary cancers are reddish pink, but this is obscured frequently by white fibrinous exudate and grey slough, the latter sometimes impregnated with calcareous deposits. Extensive slough is characteristic of carcinoma.

A tumor on a long pedicle usually is benign. The pedicle of a malignant tumor becomes infiltrated relatively early. This causes contraction and shortening to such a degree that the growth often appears sessile.

Flat carcinomas of the bladder are characterized by extensive submucous infiltration with relatively insignificant surface changes. Often the cystoscopic picture is difficult to interpret. No tumor projects into the bladder cavity. Careful search must be made for greyish or yellowish-white ulcers in a field of intense congestion before a diagnosis can be hazarded.

In every case a biopsy should be performed. It is important to classify the tumors as to type and degree of malignancy. Whenever possible the specimen should be removed from the base of the carcinoma, for it is here only that information can be obtained relative to the presence or absence of infiltration.

The information obtained by cystoscopy is supplemented materially by the cystogram. When the bladder is filled with air and stereoscopic films are taken, a beautiful picture reveals the diseased viscus as a whole. Papillary tumors are seen projecting into the vesical lumen, while the infiltration accompanying the flat type prevents expansion. This is shown by a characteristic deformity.

A search for skeletal metastases should always be made. Usually it is sufficient

to obtain films of the lumbar spine, pelvis and femurs, although we have found secondary deposits in all of the long bones, scapulae and the skull. Metastases from bladder carcinoma are demonstrated as areas of bone destruction. It seems probable that the flat carcinomas metastasize more readily than do the papillary tumors.

PROSTATE

Carcinoma of the prostate rarely occurs in men under forty; nevertheless the possibility of the disease must be born in mind whenever a man of middle age presents urinary symptoms. If rectal examinations were performed periodically upon all men over fifty it is likely that something would be accomplished toward improving the prognosis of the disease.

Prostate cancer is not rare. It comprised 17 per cent of all cases of prostatic enlargement and 4.7 per cent of all urological cases seen by Young. The same authority suggests that four men in every 100 over sixty years of age will acquire the disease.

In the great majority of cases the first symptoms are those of bladder obstruction. They begin most insidiously. In fact the disease may be present for some time without causing any symptoms whatever. If the carcinomatous growth is superimposed upon benign hypertrophy of the prostate, as was demonstrated by Geraghty in 61 per cent of his cancer cases, the symptoms are those of the benign lesion. If the malignant disease occurs alone, symptoms depend largely upon the part of the gland involved.

In most cases nocturnal frequency occurs first. Slowly it becomes more annoying. After a time there is difficulty in starting the stream and the flow of urine can be maintained only by conscious effort. Frequency by day becomes established. The patient sometimes feels that in spite of his efforts to void he is not relieved completely. If nothing is done to improve the situation, dysuria sets in, at first in the bladder region and along the course of the urethra. Later pain is more constant, low in the back or in the thighs. Occasionally there is hematuria.

The symptoms of frequency, difficult urination and dysuria are the result of an obstruction in the posterior urethra due to the carcinoma, to the associated benign hypertrophy of the prostate, or to a combination of carcinoma and inflammation. Infection of the bladder regularly follows obstruction, and the symptoms are aggravated when this occurs.

Pain low in the back, in the penis, perineum or rectum is caused usually by the presence of a large, congested tumor. When radiation is felt along the thighs, perhaps as sciatica, it indicates involvement of or pressure upon nerves of the pelvis. The localization of pain in more remote parts of the body suggests metastases. It is remarkable how extensive metastases may become without causing pain. We have seen patients with bones literally riddled who felt no discomfort at all.

Extension of the disease involves the seminal vesicles rather early because of compression posteriorly of the fold of dense pelvic fascia (Denonvilliers). In some late cases the growth infiltrates the bladder base, and may progress further, involving the anterior bladder wall. More rarely there is extension into the rectum.

The diagnosis of prostate cancer is made usually by rectal palpation. If the patient is placed in the lithotomy position and a metal sound is passed into the bladder, rectal touch may elicit more information than if the usual knee-chest position is employed. Urinalysis furnishes data of no diagnostic value. The cystoscopic picture is not characteristic although congestion and bullous edema of the bladder base are seen with some regularity.

Most commonly the prostate is large and densely indurated. More rarely the gland is of stony hardness but not especially enlarged. The shape is irregular; few of the normal landmarks persist. Nodules usually can be felt here and

there. Firm pressure causes no alteration in the remarkable fixity of the organ. Above the prostate induration can be detected frequently extending into and involving one or both seminal vesicles and passing laterally in many cases beyond the vesicles into the pelvis.

Such a picture of well established cancer is not an unusual finding when the patient first seeks medical advice. On the other hand, we feel prostates occasionally in which it is impossible by palpation alone to determine the nature of a single small area of increased density. For such cases a biopsy needle has been devised. With this instrument we have obtained positive evidence of value in about 60 per cent of our attempts. Recently, quite by accident, another test was found which may prove useful. Two patients who had prostates typical of benign hyerptrophy were treated with high voltage roentgen rays. At the end of six weeks there had been such a reduction of inflammatory swelling that indurated nodules of carcinoma stood out in bold relief.

To complete the examination, films should be taken of the lumbar spine, pelvis and femurs in search of metastases. These lesions appear usually as areas of bone proliferation or increased density. In our experience, hypertrophic osteoarthritis of the lumbar spine occurs in a large proportion of patients who have cystitis as the result of obstruction by a benign hypertrophy of the prostrate. In some cases it is difficult to differentiate the roentgenological picture of this disease from the osteoplastic metastases of a prostate cancer.

TERATOID TUMORS OF THE TESTIS

In a disease which may progress so rapidly to a fatal issue it is of the greatest importance that a correct diagnosis be made promptly. It is noteworthy that in our series of 124 cases, 43 per cent consulted physicians within a month of the time the first symptom was discovered. Seventy per cent sought medical advice within the first six months of the disease. However, the correct diagnosis was made so rarely, and for this reason so much time was lost with ineffective treatment, that when seen first at the Memorial Hospital only 11 per cent were found free from local recurrences or metastases.

The diagnosis of teratoma testis is not an easy one, but it would be made with greater frequency if physicians examined intrascrotal tumors with the possibility of malignant disease in mind. In every case of testicular tumor a careful search should be made for metastases. Conversely, whenever a man presents symptoms or signs suggestive of intrathoracic tumor, or if there is a retroperitoneal mass, or a nodule in the left supraclavicular fossa, the scrotal contents should be examined.

Teratoid tumors of the testis must be differentiated from all other intrascrotal enlargements; but the diseases which resemble them most closely are gumma of the testis, hydrocele, hematocele, and more rarely tuberculosis of the epididymis.

When seen early in the course of the disease the patient is a man usually under forty years of age. He complains of a painless swelling of the testis. Inspection reveals a unilateral enlargement without any visible inflammatory involvement, although if the tumor is large the skin may be tense. There is no apparent retraction or shortening of the penis as is seen so frequently with a hydrocele, due to an elevation of the skin at the base of the penis. Examination with transmitted light reveals the solid nature of the tumor. Palpation discloses a testicular tumor, the epididymis rarely being much enlarged. The shape of a normal testis is maintained usually, owing to the density of the tunica albuginea. The consistence in general is firmly elastic, but on account of variability in the make-up of the tumor, some portions may be stony hard, indicating cartilage or bone, while elsewhere the fingers may sink into cystic depressions. In some cases fluid is present within

the tunica vaginalis and the examination is rendered more difficult. This fluid may be aspirated without danger of disseminaing cancer cells provided the tunica albuginea is not punctured. A bloody fluid indicates that the epididymis has become involved because hemorrhage of the testicular tumor is confined within the tunica albuginea.

At the upper limit of the swelling there is usually a well-defined line of demarcation and an apparently normal spermatic cord may be felt. Very rarely the cord is sausage-shaped owing to direct extension of the disease. If pulsation of the spermatic artery can be detected, the vessel is unusually large, and a malignant tumor may be suspected. The patient seldom complains when the testis is manipulated; even a purposeful squeeze rarely elicits pain.

After the details of the primary tumor have been ascertained, the examiner should palpate the abdomen, especially of the same side, and the left supraclavicular fossa. A pelvic examination per rectum also is necessary.

Gumma of the testis often cannot be differentiated from an embryonal teratoma by the sense of touch. Clues as to the true nature of the condition may be obtained from the patient's history, but we rely especially upon the Wassermann test. With gumma a positive report is almost invariable. Of course a syphilitic may develop a teratoma.

Tuberculosis is predominately a disease of the epididymis. Most commonly there is a swelling of the epididymis in which nodules can be detected. Demonstration of characteristic changes in the prostate and seminal vesicles usually clinches the diagnosis. By contrast, the infrequent teratoma which invades the epididymis is likely to reach larger dimensions in a short time, be free from nodules, and show no marked inflammation or tenderness.

The abdominal metastases of teratoma testis are deeply situated. They feel rounded, solid and immovable, although sometimes they pulsate with the aorta. They do not conform to the shape of renal or splenic tumors, and cannot be grasped bimanually owing to their fixed retroperitoneal position. Tympany by percussion may be elicited over these masses, and if on the left side, inflation of the stomach covers the swelling.

In addition to a thorough physical examination, a roentgenogram of the chest should be made in search of metastases in the lungs or mediastinum. Such a film may reveal clean cut rounded masses in the mediastinum. These appear to be the result of direct extension of the disease up the prevertebral lymph channels. Metastatic deposits in the lungs are characteristically dense, clean cut, and round or ovoid. The shape indicates invasion by way of the blood stream and their development within veins.

If all other diagnostic measures have been exhausted and doubt still exists concerning the nature of the testicular tumor, it should be subjected to a therapeutic test. An erythema dose of high voltage roentgen rays delivered to the center of the mass causes a rapid regression in the size of the great majority of teratomas. If the tumor is made up of radioresistent adult tissues, there is no appreciable response.

EPITHELIOMA OF THE PENIS

Penis cancers originate almost invariably beneath a tight, redundant prepuce or one seldom retracted and cleaned.

Clinically there are two types of the disease, the papillary and the flat. The latter is deeply indurated. From the histological standpoint, each is a squamous carcinoma.

The papillary tumor takes its origin from single or multiple warty excrescences which grow rather rapidly in size, increase in number, and later become confluent. After a time part of the tumor breaks down forming a necrotic crater. As a result an acrid, foul smelling, purulent fluid is discharged from beneath an inflammed

prepuce. The tumor spreads by gradual involvement of contiguous structures and at the same time it penetrates more deeply.

The flat type, which constituted 56 per cent of our cases, begins as a rounded erosion with slightly elevated edges. It extends laterally. At all stages this tumor is characterized by its dense induration. Ulcers appear as shallow excavations, yellowish in color. A foul discharge is present.

It is noteworthy that although phimosis and chronic balanitis with their attendant irritation have been present for years, when the cancer appears, practically every patient recognizes the condition as something decidedly different, even if its nature is not appreciated. Moreover, in every case in which the growth could be exposed, the area of true epithelioma was quite small when it was noticed first.

In a series of 75 cases, the first symptom of 73 per cent of the patients was a small sore on the penis. Nine per cent were aware of increased irritation soon followed by the appearance of a small sore. Five per cent suffered from paraphimosis, circumcision revealing a carcinoma. Five per cent first saw warts beneath a tight prepuce. When leucoplakia precedes cancer of the penis the patients notice an area of "scaly skin" or what appears to be a "corn." Occasionally the first intimation of the disease is a hard nodule situated in the distal third of the penis. When it is impossible to retract the prepuce to afford a thorough examination of the lesion, a dorsal slit or lateral incisions should be made. Care should be taken to avoid cutting through cancerous areas.

Of the more common lesions presenting an appearance similar to that of epithelioma of the penis may be mentioned various manifestations of syphilis, papillomatosis of the penis, granuloma inguinale, and certain chemical reactions such as those caused by bichloride of mercury or the cresol derivatives. Sometimes it is extremely difficult to differentiate these conditions with certainty, especially when the original appearance has been altered by treatment. For this reason the diagnosis of carcinoma of the penis should be made histologically. We believe that a biopsy, carefully performed with a sharp razor, does little if anything toward hastening metastasis. No doubt in most instances a competent physician can make a correct clinical diagnosis; still the records show that much time has been lost following inappropriate therapy before the nature of the lesion was discovered. Moreover, following Broder's grouping of epithelial tumors, scientific treatment is based upon the intimate details of cellular structure and arrangement. This is revealed only by the microscope.

Metastasis occurs relatively late in the course of the disease, but inguinal adenopathy is a common finding. On account of early ulceration of the primary lesion and its environment of filth, the great majority of patients (85 per cent in this series), present palpably enlarged nodes at their first examination. Inguinal metastases usually can be differentiated from purely inflammatory nodules because of a greater degree of induration in early cases and later, when tumor growth has penetrated the capsule of the lymph node, the secondary cancer is fixed.

BIBLIOGRAPHY

Barringer, B. S. and Dean, Archie, L., Jr. *J. A. M. A.*, 77: 1237, 1921.

Dean, Archie L., Jr. *Am. J. Roentgenol.*, 15: 36, 1926.

Dean, Archie L., Jr. *J. Urol.*, 8: 149, 1925.

Coley, William B. *Ann. Surg.*, 48: 321, 1908.

Colston, J. A. C. *J. Urol.*, 5: 67, 1921.

Ewing, J. *Surg. Gynec. Obst.*, 7: 230, 1911.

Ewing, J. Neoplastic Diseases. Phila., Saunders, 1919.

Failla, G. and Quimby, E. H. *Am. J. Roentgenol.*, 10: 944, 1923.

Hinman, Frank. *Surg. Gynec. Obst.*, 28: 495, 1919.

Lowsley and Kirwin. A Textbook of Urology. Phila., Lea and Febiger, 1926.

Osler, W. *Lancet*, 1: 1409, 1907.

Young, H. H. Practice of Urol. Phila., Saunders, 1926.

TUMOR OF THE BONY THORACIC WALL

ASSOCIATED WITH TRAUMA
LITERATURE AND CASE REPORT*

CHARLES BRUCE MORTON, M.D.

UNIVERSITY, VA.

IN a recent paper on thoracic tumors Heuer stated that a total of about 240 cases of tumors of the bony thoracic wall had been reported in the literature. He referred to cases compiled by Parham (1898), Lund (1913), Hedblom (1921) and himself. He gave the following statistical summary:

Nearly 80 per cent of these were cases of tumors of the ribs and 20 per cent tumors of the sternum. One hundred and seventy-seven (86 per cent) tumors were primary; 4, probably primary; 11, secondary to tumors of the breast, and 13, secondary to other primary lesions. Pathologically, from 60 to 65 per cent were sarcomas, from 15 to 18 per cent chondromas and 11 per cent carcinomas. Benign tumors other than chondromas have been rare. A few cases included in the series were cases of inflammatory swellings. The difficulties in diagnosis have been the differentiation between benign and malignant tumors. The difficulties in treatment concern the wide opening of the pleura necessary in resection of the thoracic wall, the involvement of intrathoracic structures such as the lung and diaphragm and the secure closure of the thoracic wound. The operative mortality has been reduced from about 30 to about 15 per cent; in individual series it has been as low as 5 per cent. The late results leave much to be desired. The follow-up is given in only 67 of the entire series.

In the group of cases of malignant tumors there was freedom from recurrence in 19 at the time of the last report; but in only 3 of these did the freedom from recurrence extend beyond a three-year period. In the 3 cases there had not been a recurrence for four, seven and nine years respectively. In the group of patients with chondromas, 30 per cent are reported cured, but in many of the cases the period of observation had not extended beyond two years. It is apparent from this summary that the important considerations in this group of tumors are early diagnosis, early radical operation and accurate follow-up studies.

In the light of this summary of the subject the following case seems of sufficient interest to merit a brief report.

CASE HISTORY

R. B.: The patient, a colored man aged sixty-three years, entered the University of Virginia Hospital September 11, 1928. The family history was negative. When about thirty-seven years of age he had suffered with shortness of breath for a period of a month or more. At that time a large abscess had appeared on the lower part of his right chest in the posterior axillary line. After it had been opened and a large amount of pus evacuated, he had improved rapidly and soon recovered entirely. Six years before the time of his admission he had fractured some ribs on the right side.

The chief complaint was a large mass on the right side of his chest of three years' duration. He had first noticed it a few weeks after he had received a blow which fractured two ribs at the point where his ribs had been fractured previously. The mass had increased in size slowly and had not troubled him until about four months before the time he came for examination. During that period the mass had enlarged more rapidly and had caused some pain.

Examination revealed a well-nourished colored man. The temperature, pulse, respiration and blood pressure were normal. There was some opacity of the cornea of the left eye. The teeth were badly decayed. The heart and lungs showed no abnormality. On the right side of the chest there was an irregular mass about 10 cm. in diameter and protruding about 4.5 cm. above the surface of the chest. Its center overlay the costochondral articulation of the eighth rib. The tumor was very hard, nodular and firmly fixed to the ribs. About 10 cm. lateral to the outer margin of the mass was the old scar of an incision made into the

* From the Dept. of Surgery & Gynecology, Univ. of Virginia. Submitted for publication Nov. 19, 1929.

abscess already mentioned. Examination of the blood and urine showed nothing abnormal and the Wassermann reaction was negative. Stereoscopic roentgenograms of the chest revealed a mass in the region of the costochondral articulations of the seventh and eighth ribs (Fig. 1). The tumor had expanded within the interior of the thorax and pushed aside the parietal pleura. The appearance of the tumor suggested osteochondroma rather than sarcoma. The patient was advised to have the tumor removed.

Fig. 1. Roentgenogram of tumor, lateral view.

On September 14, 1928, I made a transverse, elliptical incision over the mass leaving a small area of skin attached to the growth (Fig. 2). Dissection revealed a mass which was an integral part of the seventh and eighth ribs. To remove the mass it was necessary to resect portions of the seventh and eighth ribs and their attached cartilages (Fig. 3). The mass projected into the chest cavity for a distance of about 4 cm., but it was possible to separate it from the parietal pleura without injury to the pleura (Fig. 4). The defect in the chest wall was covered by the flaps of the skin alone and a small rubber drain was placed in the dependent angle to remain there for twenty-four hours.

Fig. 2. External aspect of tumor after its removal.

The pathological report described a solid, encapsulated tumor which included portions of two ribs and their cartilages. The mass measured 11 × 10 × 9 cm. Microscopically the tissue was an osteochondroma. It contained quantities of calcium and apparently arose in the costochondral junction (Fig. 5). The postoperative convalescence was entirely uneventful and the patient returned to his home on the twelfth day after operation. The wound had healed completely.

Fig. 3. Intrathoracic aspect of tumor.

A follow-up letter was answered by the patient November 9, 1929, more than a year

after excision of the tumor. He stated that he was enjoying good health and that there had been no recurrence of the tumor.

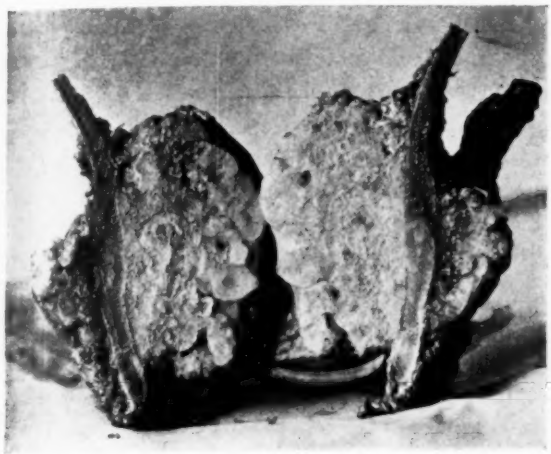


Fig. 4. Cross section of tumor. About one-third of the mass was within the thorax. Note the costochondral junction.

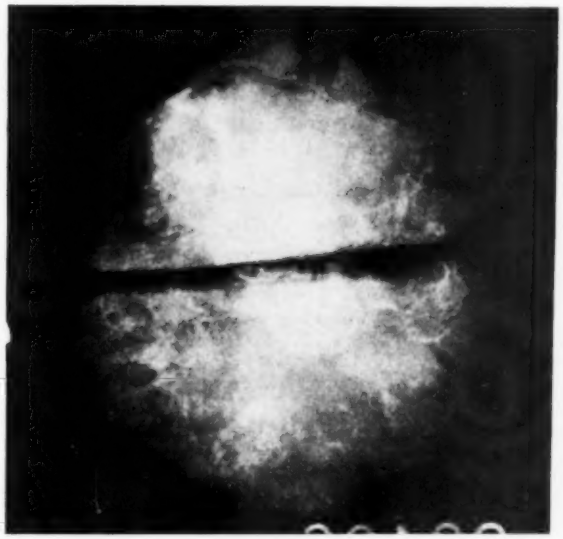


Fig. 5. Anteroposterior roentgenogram of tumor after it had been removed and sectioned.

DISCUSSION

This tumor of the bony thoracic wall is of particular interest from the standpoint of etiology. Six years before the patient entered the hospital one or more ribs had been factured at the site in which the tumor subsequently formed. Three years before his admission the same ribs had been fractured again and it was shortly after the second fracture that he first noticed the mass.

The relationship between trauma and the formation of tumors has been the subject of widespread discussion among pathologists for many years. An admirable review of the literature on the subject was made by Knox who concluded that a causative relationship between a single trauma and tumor formation had never been completely established. She mentioned the fact that it has never been possible to produce a malignant growth experimentally in animals by a single trauma.

Williams admitted the possibility of an osteochondroma arising from the cartilage cells in the callus following a fracture. Ewing apparently believes that a causative relationship between trauma and tumor formation may exist in certain cases but discredits the majority of such supposed cases and states five postulates which must be fulfilled in order to predicate a relationship:

1. The authenticity and sufficient importance of the trauma must be established.
2. The previous integrity of the wounded part must be established.
3. A reasonable time relationship, from three weeks to three years, must have existed.
4. The identity of the injured area with the site of the tumor must be established.
5. The tumor, microscopically examined, must be of a type that reasonably could be caused by trauma. Dermoids and other tumors arising from cell rests and so forth are thereby excluded.

The case herewith reported seems to fulfill the postulates. The facts stated in the history were volunteered and no factor of personal aggrandizement or compensation was present to vitiate the reliability of the statements.

That trauma, however, cannot bear more than a predisposing or secondary relationship to tumor formation is demonstrated by the fact that all trauma is not followed by tumefaction and that not all

tumors are preceded by trauma. In this case the trauma which fractured the rib or ribs at the costochondral junction may have displaced some cartilage cells which, when removed from their normal environment of restraining membrane and pressure relationships, commenced to grow unrestrainedly and finally formed the large tumor.

A somewhat analagous sequence of events seems to occur in the juxta-epiphyseal osteochondromata which occur along the ends of the shafts of the long bones, especially the femur, humerus and tibia. As the bone formation of linear growth at the epiphyseal line progresses, small islands of cartilage cells become stranded along the shaft and continuation of unrestricted development in these islands causes the formation of osteochondromata at the site. Ewing recognizes such tumors. In a recent article by Miller and Roberts the sixth illustration depicts a characteristic tumor of that type on the upper part of the humerus.

In this instance, repeated fracture of the rib or the separation of the costochondral articulation may have merely overstimulated the normal processes of repair in some such manner as to cause tremendous proliferation of tissue and the formation of the tumor.

Four months prior to the time of examination the tumor had begun to grow more rapidly. What the stimulus was can be no more than a conjecture. That it may have been a preliminary stage to the development of malignant cells within the tumor must be considered, although no evidence of malignant change was found grossly or microscopically. The importance of prompt excision of such tumors of the bony thoracic wall is emphasized by this consideration and also by the extent to which the mass had invaded the chest cavity. Had the parietal pleura been intimately enough adherent to the tumor to necessitate entering the pleural cavity to excise the growth, the operation would have been much more hazardous than the extrapleural excision proved to be.

SUMMARY

A brief statistical summary of tumors of the bony thoracic wall was given. The history of a case of osteochondroma of the chest wall was reported briefly. In this case there seemed to be a rather definite causative relationship between a single trauma and the formation of the tumor. Some literature on the subject was quoted and the case was discussed from that standpoint. The importance of prompt early excision of such tumors was mentioned.

BIBLIOGRAPHY

1. Ewing, J. Neoplastic Diseases. Ed. 3, Phila., Saunders, 1928.
2. Heuer, G. J. Thoracic tumors. *Arch. Surg.*, 18: 271–282, 1929.
3. Knox, L. C. Trauma and tumors. *Arch. Path.*, 7: 274–309, 1929.
4. Miller, O. L. and Roberts, W. M. Isolated exostoses or osteochondromata of developmental type. *South. M. J.*, 22: 974–976, 1929.
5. Williams, R. The Natural History of Cancer. N. Y. Wood, 1908.

PERIARTERIAL SYMPATHECTOMY

IN CIRCULATORY DISTURBANCES OF THE EXTREMITIES*

CHARLES C. GREEN, M.D.

HOUSTON, TEXAS

IN 1921 there appeared an article by Lariche,[1] reporting his results from periarterial sympathectomy in 100 cases. In 1924 Arthur W. Allen of Massachusetts General Hospital published his results based on a smaller group of cases. Both of these reports were rather sanguine in their tone and gave the impression that much good could be expected from this new procedure.

Following these articles there was a mad rush on the part of many surgeons to use this method in treating all kinds of circulatory disturbances which included causalgia, painful amputated stump endarteritis, traumatic contractures, trophic ulcers, edemas and various ischemic sequelae. And, as a natural course of events, a widespread discussion on the circulation and vasomotor fibers to the extremities, was provoked, which resulted in the development of two schools.

The first group believed that the principal sympathetic nerve fibers accompany the main arteries which supply the extremities and form a network around them in the adventitial layer.

The second group believed that the sympathetic nerve fibers accompany the main nerve trunks which supply the extremities. Thus we have an apparent contradiction but not a real one, as it is an accepted fact that both of these sets of sympathetic fibers supply the extremities, and in order to get the best results a periarterial sympathectomy and nerve stretching must be done.

So numerous are the causes of leg ulcers such as eczema with its cutaneous and fat atrophy, infected ulcers following scratches, tuberculosis and lues, and last, but by no means least, trauma in the presence of varicosities, that the profession has simply classified them as chronic ulcers without considering the underlying pathology. One only has to read of the myriad of methods suggested for the relief of these conditions, along with the categorical statements of the marvelous and everlasting cures recorded by one group of surgeons and the absolute failures, with the same methods, reported by other surgeons, to realize the chaos which exists at present in the treatment of so common a disease which seems to resist all human efforts.

There are several facts, however, which contribute to our failure in these cases. First, a disinterested and discouraged profession. Leg ulcers constituted no mean percentage of cases in the clinic while we were medical students. The greater portion of them were still uncured when we finished the course. What effect does this have on our profession? Those whom we looked to for instruction failed in their efforts to conquer this disease, with the result that in our subconscious minds we were fully convinced that such conditions could not be cured. We have continued treating them just as was done in the clinics, and with the same results.

Another cause of failure in the treatment of these ulcers is the fact that the underlying pathology has not been considered. We have failed to recognize the fact that all ulcers do not arise from the same cause. For example, one cannot expect to cure a luetic ulcer of the leg simply by increasing the blood supply to this part. Nor can one expect this operation to regenerate the walls of arterioles and capillaries when there is complete organic degeneration of the vessel walls.

But there are two types of ulcers in which this operation will definitely help,

[1] Lariche. *Ann. Surg.*, 1921.

* Read before the Texas Surgical Society. Submitted for publication October 3, 1929.

namely, eczematous and varicose ulcers. Here there is no organic destruction in any part of the arterial blood system, but the pathology is in the venous system. So if we can increase our visatergo and get an increased supply of fresh blood to the parts, we have reason to believe that the ulcers will heal. And this operation does supply fresh blood to the affected parts.

A brief discussion of the technic of this operation will demonstrate the means by which the operation produces a cure.

After preparing the extremity, we make an incision through the overlying structures to expose the vessel. Inspection readily demonstrates a thin covering around the vessel which contains the sympathetic fibers supplying the artery. This tissue is dissected away from the walls of the vessel around its entire circumference and for a length of about two inches. When sufficient amount has been removed the vessel wall has a glistening appearance. The first effect upon the vessel is a constriction which is very apparent during the operation. But this is temporary and is termed the "primary reaction" and is followed in a few hours by a dilatation of the artery, terminal arterioles and capillaries resulting in a definite arterial hyperemia which persists for a period varying from a few weeks to several months.

This hyperemia changes the appearance and condition of the limb from a cold blanched extremity to a warm pink one, in just a few hours. And the change is very apparent and definite.

We have used this method in a limited number of selected cases, but the results have been so satisfactory that the author wishes to make a preliminary report on his primary results and at a later date give you the end-results after a sufficient length of time has elapsed to enable him to determine whether the ulcer will return or not.

Case I. White woman, fairly well nourished, consulted us for bilateral varicose leg ulcers which had resisted all treatment for six years. She had used all kinds of treatment including rest in bed, but the ulcer would heal up to a certain point or would heal entirely, only to break down again when she got up and about. On January 25, 1928 a periarterial sympathectomy was performed on the right femoral. The characteristic changes appeared in a very few hours and on about the fourth day the granulation took on a red firm healthy appearance. No further treatment was instituted; only a vaseline gause was applied every second day. By the end of four weeks the ulcer was entirely healed over.

On February 29, 1928 the same operation was performed on the other side and the progress of the case was the same as in the other leg: the ulcer was healed over in four weeks. This patient was kept in the hospital, made to walk around without any dressings and left the hospital seventy days after the last operation, with both legs healed over. A report sixty days later states that her legs are still perfectly well and she is able to go on with her house work.

Case II. White man, varicose ulcer of one leg, five years' standing, with same history of having had all kinds of treatment including skin graft. His ulcer was deep. A periarterial sympathectomy was performed on him and in six weeks his ulcer was healed over. He left the hospital sixty days later without his ulcer. He was a regular attendant at the clinic but since he left the hospital we have heard nothing from him nor has he returned to the clinic, so we judge he has had no further trouble.

Case III. A white woman with a large varicose ulcer of leg was given the same treatment, with the same results. She left the hospital in four weeks entirely cured. There was no subsequent report from her.

While we admit that such a small number of cases can not be taken as conclusive evidence that this operation is the treatment of choice in leg or arm ulcers, still our results have been so uniform and so perfect that we felt it worth your while to listen to our preliminary report of these cases.

We shall attempt to get in touch with these cases at a later date and also to get new cases and give you more information regarding the final outcome of these cases sometime in the near future.

TREATMENT OF DIAPHRAGMATIC HERNIA*

LEIGH F. WATSON, M.D.

LOS ANGELES, CALIF.

IT IS only in recent years, with the improved methods of diagnosis, that nonstrangulated diaphragmatic hernia has been recognized early and treated by operation, resulting in the development of a successful surgical technic.

On account of the severity of the symptoms and the danger of strangulation, the radical operation by the abdominal route is the treatment of choice. The thoracic route is preferred by a minority of surgeons. When it is impossible to reduce the hernia from the abdominal side, it is necessary to make use of both incisions.

THE ABDOMINAL OPERATION

The abdominal route is indicated when there has been injury to abdominal viscera and when there are symptoms of intestinal obstruction. It enables the operator to confirm the diagnosis promptly and in case intestinal resection is necessary, it affords the better exposure and permits a quicker repair. The patient suffers less from shock following laparotomy than after thoracotomy.

The patient is placed in the Trendelenburg position and the abdomen opened by an incision above the umbilicus in the midline, or by a lateral rectus incision, or by one of the gallbladder incisions. A free exposure is essential, and it is often advisable to carry the incision one or two inches (2.5 to 5 cm.) below the umbilicus.

On opening the abdomen, the operator will immediately notice that certain of the viscera are not in their normal position; the organs most frequently herniated are the stomach, transverse colon and small intestine. With the patient thoroughly relaxed under general anesthesia, the hernial opening in the diaphragm is exposed by wide retraction, and the hernia reduced by grasping the portion of viscera still within the abdomen and making gentle traction on it; reduction may possibly be facilitated by placing the patient in a vertical position. If reduction cannot be accomplished, the hernial opening can be enlarged; this failing, it is necessary to open the thoracic cavity, free the adhesions and reduce the hernia. In Scudder's patient, a stomach tube was passed and the viscus emptied by compressing it in the chest; the hernia was then reduced without difficulty. Mayo passes a rubber tube into the chest through the hernial opening to relieve the suction force of breathing.

The principal disadvantages of the abdominal route are, the depth of the hernial opening, the impossibility of freeing extensive adhesions in the thorax, and the difficulty of preventing the viscus in the hernia from being drawn back into the chest with each inspiration.

The method of closure of the diaphragmatic opening depends on its size and location. If the edges of the opening can be brought together, the hernia can be closed with interrupted or mattress sutures of heavy chromic catgut, taking a deep bite in the muscle with each stitch; this closure can be reenforced by a second layer of sutures, either continuous or interrupted. Soresi closes these openings by taking a number of stitches on each side, parallel to the edge of the opening; these stitches are tied together on each side and then tied across, leaving a small opening at each end to be closed by purse string sutures.

If drainage of the pleural cavity is necessary, it can be secured by making a stab wound, with a sharp-pointed hemostat, passed through the diaphragmatic opening, and through the posterior part of the chest wall between the ribs, at the lowest point of the pleura. The line of suture of the diaphragm is often reenforced

* Submitted for publication November 9, 1929.

by sewing a strip of fascia or a portion of the omentum or stomach, which has been in the hernia, to the edges of the opening.

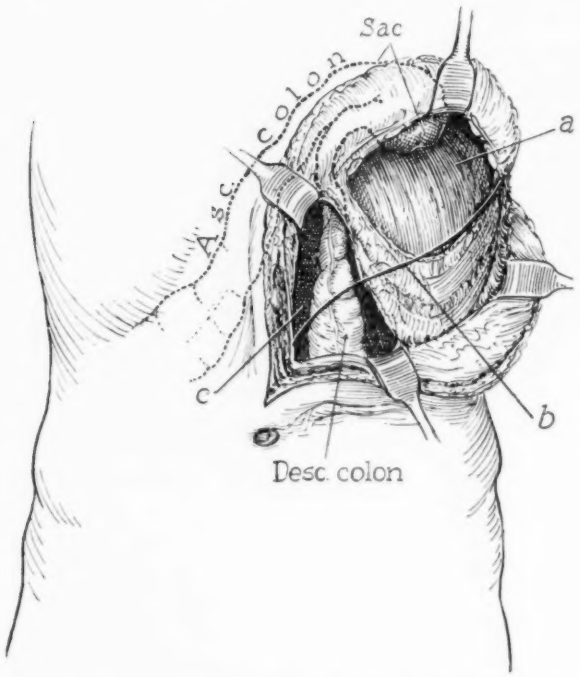


FIG. 1. The combined thoraco-abdominal incision for diaphragmatic hernia. The 6th and 7th ribs are shown resected. (a) The pleural cavity. (b) Line of skin incision. (c) The abdominal cavity.

If the hernia cannot be reduced, and the condition of the patient does not permit opening the thorax, a gastrojejunostomy can be done; if the transverse colon is in the hernia, the ascending and the descending colon can be anastomosed.

THE THORACIC ROUTE

The thoracic operation should be used when there is traumatic injury of the pleura, lungs, heart or blood vessels, accompanied by hemorrhage. The wound in the chest acts as a guide down to the hernia, which can be freely exposed simply by enlarging the wound.

The advantages of the thoracic route are: It is easier to deal with the hernia because it is nearer the surface than when approached from the abdomen; the hernia can be more readily reduced, and the adhesions to the pleura and pericardium can be freed; and it is less difficult to close the hernial opening. If gangrene has already occurred, the thoracic route should be used first, because of the chance of perforation having occurred, and the danger of tearing the viscera in reducing the hernia. The abdominal viscera should be examined and treated through a laparotomy incision.

The patient is usually placed on the table in a lateral position. The intercostal space is widened by means of a pillow or sand bag under the chest. The incision is made in the eighth or ninth intercostal space and is 4 to 5 inches (10 to 12.5 cm.) in length. Strong retraction is made and the ribs widely separated. It is usually possible by this means to avoid the resection of one or more ribs. If the exposure is insufficient, it is necessary to resect the costal arch.

I believe that the best exposure is obtained by an incision which begins at the lower edge of the rib at the end of the xiphoid cartilage, divides the rectus muscle, and enters the intercostal space between the ninth and tenth ribs without opening the pleura.

The hernia is reduced, the excess of sac is folded upon itself and used as a pad to close the opening, or the sac can be resected and the edges overlapped and sutured. The edges of the hernial opening are brought together by interrupted sutures of heavy chromic catgut, or one of the methods of closure used in the abdominal operation can be used here.

When the opening in the diaphragm cannot be closed by ordinary means, it can be accomplished sometimes by resecting the ribs in front of the hernia. The danger of pneumothorax is generally overestimated; if the chest is opened gradually, the symptoms are slight. A differential pressure cabinet is unnecessary. If dyspnea appears during operation, the lung should be drawn down to the wound and steadied with a soft rubber covered forceps. Before completing the operation, one should insert into the pleura a small blunt trocar attached to a syphon bottle. At the

completion of the suture all the air in the chest can be readily aspirated, and the lung reexpanded.

If the chest has been opened under local anesthesia, the patient can be allowed to come out of the general anesthetic as soon as the diaphragm is closed; with assistance, he can close his mouth, hold his nose, and by blowing, expand the lung as the final suture is tied. If there is danger of infection, or if there has been an extensive separation of adhesions, a drain can be left in the pleura; however, when possible, the wound should be closed without drainage.

THE COMBINED THORACO-ABDOMINAL OPERATION

The combined operation is the treatment of choice in a great many cases; it is being used with increasing frequency. Often it is necessary to open both the thorax and the abdomen, to reduce the hernia and to deal with complications. Some operators prefer to open the thorax and then the abdomen by separate incisions; others use the single incision which exposes both cavities simultaneously.

Schwartz and Quénu recommend the combined thoraco-abdominal route in all cases. The incision begins in the axillary line and extends forward in the seventh intercostal space. The pleural cavity is opened, care being taken to avoid a too sudden pneumothorax or injury to herniated viscera that may be adherent to the chest wall. The incision curves downward over the rectus muscle to the midline, and then down to the umbilicus. The peritoneal cavity is opened; the cartilaginous portion of the ribs, at the site of incision, is cut with scissors; and the incision continued in a straight line through the diaphragm to the hernial opening. The adhesions are separated, the viscera reduced, the margins of the opening freshened and sutured, the cartilaginous edges brought together and the wound closed. If necessary, a drain can be left in the lower part of the pleural cavity for two or three days. Auvray resected the ninth rib and continued the incision down to the umbilicus. He cut through the ninth costal cartilage and incised the diaphragm up to the hernial opening. The hernia is reduced, the opening sutured, and the wound closed.

REFERENCES

1. Auvray, M. Hernie diaphragmatique de l'estomac, du côlon transverse et de l'épiploon, consécutive à une plaie thoracoabdominale ancienne. Intervention. Guérison. *Bull. et mém. Soc. de chir. de Par.*, 45: 698–709, 1919.
2. Mayo, C. H. Repair of hernia of the diaphragm. *Ann. Surg.*, 86: 481–484, 1927.
3. Schwartz, A., and Quénu, J. Le traitement des hernies diaphragmatiques (technique opérertoire). *Paris méd.*, 33: 162–165, 1919.
4. Scudder, C. L. A case of non-traumatic diaphragmatic hernia. *Surg. Gynec. Obst.*, 15: 261–267, 1912.
5. Soresi, A. L. Diaphragmatic hernia. *Ann. Surg.*, 69: 255–270, 1919.

CRANIOCEREBRAL INJURIES*

JOSEPH F. DOUGHERTY, M.D.

UPPER DARBY, PA.

CRANIOCEREBRAL injuries are of very frequent occurrence. They make a large percentage of the accident work admitted to a general hospital. The group of 25 cases which I am reporting were consecutive admissions to the surgical service of Dr. Thomas J. Ryan at the Misericordia Hospital during a period of one year. It is my purpose in this review to outline our mortality, the method of treatment and give a short discussion of the sequelae. We have divided these cases into laceration of the brain and fracture of the skull. Only those cases are reported as fracture which were positive by *x*-ray findings. The cases which were diagnosed as laceration of the brain were negative for fracture by *x*-ray examination, but had bloody spinal fluid and alterations in the spinal fluid pressure. The cases were divided as follows:

	Number	Deaths	Mortality, Per Cent
Laceration of brain	9	0	0
Fracture of skull	16	4	25
Total	25	4	16

In reviewing the mortality in the literature during the past few years I find that Stewart[1] reported 617 cases with 322 deaths, a mortality of 52 per cent; McCreery[2] and Berry report 520 cases with 204 deaths, a mortality of 39 per cent; Djerup[3] of Copenhagen reports 57 per cent mortality. It is interesting to note the variance in these mortality figures. The 57 per cent mortality of Djerup is included in this discussion because it is his practice too perate on all cases which present any signs of increased intracranial pressure.

PATHOLOGY

It is necessary to have a definite conception of the circulation of the cerebrospinal fluid in order to manage these cases intelligently. The fluid is secreted by the choroid plexus in the ventricular system and communicates with the subarachnoid space through the foramina of Magendi and Luschka. The fluid circulates in the subarachnoid space and is absorbed into the dural sinuses by the pacchionian bodies which are arachnoid villi projecting into the sinuses.

The early symptoms resulting from head injuries are dependent upon the damage done to the contents of the skull rather than to the skull itself. The injury to the skull is important if the fracture is compound or if it is depressed and causing symptoms. The pathology which exists in the brain varies from contusion and mild edema to petechial hemorrhages and extensive lacerations. There is no organ in the body in which the effects of pressure are so serious as in the brain, owing to the fact that it is confined in a bony case incapable of expansion. It is true that a slight increase in pressure may be compensated for by the communication between the cranial and spinal cavities; but this is limited.

The sequence of changes occurring in the circulation of the fluid as a result of these injuries has been well described by Jackson,[4] "As a result of trauma a local swelling of the brain soon arises at the site of injury and reaches its maximum in twenty-four to forty-eight hours. If the swelling is slight the interference with absorption of cerebrospinal fluid is only moderate and the intracranial pressure will return to normal in a few days. If, however, the local swelling is more marked the general effects will be more serious."

As the local swelling increases the cere-

* Submitted for publication December 31, 1929.

brospinal fluid is driven out of the cerebral subarachnoid space into the corresponding space in the spinal canal. The brain is pressed against the vault of the skull, the subarachnoid space is compressed and obliterated, and the absorption of the cerebrospinal fluid from that space stops completely. Circulation of the fluid ceases and stasis results. The accumulating fluids in the basal cisterns pushes the brain still more forcibly against the cranial vault, still more effectually interfering with absorption. As the brain is pushed upward the brain stem tends to plug the narrow incisuria tentorii, so that the fluid accumulates in the basal cisterns and distends the ventricles, producing a form of communicating hydrocephalus.

TREATMENT

The treatment of these head injuries falls under the ten following divisions:

1. Shock.
2. *X*-ray.
3. Spinal fluid pressure.
4. Spinal drainage.
5. Glucose 50 per cent.
6. Magnesium sulphate.
7. Neurological consultation.
8. Eye consultation.
9. Otolaryngological consultation.
10. Operation.
    - (a) Compound fracture.
    - (b) Depressed fracture.
    - (c) Foreign body.
    - (d) Extradural hemorrhage.
    - (e) Intradural hemorrhage.

Upon admission the case usually presents symptoms of shock which are treated in the usual manner. No operation is performed at this time unless we feel that the condition present within the brain is adding to the amount of shock. Lacerations are debrided, the bone investigated and the scalp is sutured loosely. The blood pressure is recorded and spinal puncture performed. The spinal puncture is instituted as soon after admission as possible. The spinal fluid pressure is estimated and the amount of fluid withdrawn is dependent upon this pressure. Frequent pressure readings are recorded during the withdrawal of the fluid to assure of free circulation. If the spinal fluid pressure is increased beyond 30 mm. Hg it is reduced 50 per cent; if it is below 20 mm. Hg it is reduced to normal. The spinal fluid pressure is estimated as frequently as symptoms demand, the attending physician being guided by blood pressure readings, mental condition and pulse rate. However, this reading is estimated at least once a day until the pressure returns to normal. If the fluid is bloody but not under pressure it is removed daily until it becomes clear. X-ray examinations are made as soon as the shock has subsided, although at times we have found it necessary to have this examination performed in order to confirm or outrule the diagnosis of a depressed fracture. Intravenous injections of 50 per cent glucose are given for the purpose of reducing intracranial pressure and at the same time acting as nourishment to the patient during the first few days when he may not be able to take food by mouth.

Magnesium sulphate is also given by mouth and rectum for the purpose of reducing intracranial pressure. Neurological consultation is instituted as an emergency procedure and we are guided to a considerable extent by the decision of the neurologist. We rely almost completely upon the deductions of our neurologist for the institution of operative procedures unless the indications are very evident upon admission, such as a compound fracture, a depressed fracture or foreign body. Eye consultations were originally performed within the first two or three days following admission, but we now find that more information can be gained by having this consultation at a later date. Otolaryngological consultation is always performed in the cases with discharge from the ears, nose or mouth. In regard to the late operations for these head injuries we are inclined to wait until

definite decision has been made by the neurologist.

SEQUELAE

The important complications which occurred in this group were blindness in the right eye in one patient with a fracture of the vault, weakness in the left arm in a patient with a depressed fracture which was operated, and left hemiplegia in a patient with a fracture of the vault. In 12 of these cases we have been able to determine the late symptoms over a period of from one to six months, although we realize that this is a short period of time to judge the late symptoms. We hope in the future to make a further contribution to this subject with relation to these symptoms and the intracranial pressure. Four of these patients have complained of persistent headaches, although they have all returned to the same occupation that they followed before the injury. In examining the literature of the late head symptoms we find that there is not a large group of cases reported. The question might arise as to the wisdom of treating these cases conservatively, but we are convinced from the study of the physiology and pathology of this condition that the treatment should be conservative and operations be performed only after considerable deliberation.

It appears from these reported cases that the late symptoms vary a great deal, but judging from the literature, better end-results may be expected following conservative management.

	Cases	Headaches, Per Cent	Dizziness, Per Cent	Epilepsy, Per Cent
Jackson[4]	295	17	4	8
Strecker, E. A.[5]	30	80	..	23
Hanse, A.[6]	88	..	..	19
Dougherty, J. F.	12	33	0	0

CONCLUSIONS

1. Conservatism in the treatment of craniocerebral injuries will probably show the best immediate and late results.

2. The intracranial pressure can in most cases be adequately controlled by the judicious use of spinal drainage in conjunction with a spinal manometer. The manometer should always be used in doing a spinal puncture.

3. A clear understanding of the pathology is necessary for the proper management.

4. Operation should not be instituted unless very definitely indicated.

BIBLIOGRAPHY

1. Stewart. *J. A. M. A.*, 77: No. 26, 1921.
2. McCreery, J. A. and Berry, F. B. *Ann. Surg.*, 88: No. 5, 1928.
3. Djerup. *Hospitalstid.* 88: No. 5, 1928. 71: 25, 1928.
4. Jackson. *Surg., Gynec. Obst.*, 34: No. 4, 1922.
5. Strecker, E. A. and Ebaugh, F. G. *Arch. Neurol. & Psychiat.*, 12: 443, 1924.
6. Hanse, A. *Arch. f. Psychiat.*, 76: 172–211, 1925.

GASTROCOLIC FISTULA*

BRIEF REVIEW OF LITERATURE AND REPORT OF CASE

MEYER GOLOB, M.D.

NEW YORK

THE condition of gastrocolic fistula, or cologastric fistula as I prefer to call it in my case because the lesion originated in the colon, is sufficiently unusual to justify report of a case. The majority of cases of gastrocolic fistula occur as a sequel to posterior gastroenterostomy for jejunal ulcer. In the case reported, the condition was apparently primary carcinoma of the colon, which formed a fistulous connection with the stomach.

Verbrugge[1] in 1924 collected 202 cases of gastrocolic and gastrojejunocolic fistulae from the literature, including 7 cases previously reported from the Mayo Clinic, and added 14 new cases from the Clinic, making a total of 216. In 95 of these cases, the fistula resulted from a jejunal ulcer following posterior gastroenterostomy; in 121, from a primary organic lesion of the stomach or colon, chiefly carcinoma. The 70 cases reported prior to 1903 originated from cancer of the stomach or colon.

According to recent reports, to quote Verbrugge:

> Fistulas due to cancer of the colon and stomach seem to be decreasing, whereas fistulas following gastroenterostomy are increasing. This can easily be explained by the fact that early diagnosis and intervention in cases of cancer of the digestive tract have reduced the number of these large tumors, whereas the more frequent use of posterior gastroenterostomy for gastric, and especially duodenal, lesions has increased the number of jejunal ulcers.

Of the 21 cases of gastrocolic fistula from the Mayo Clinic, 2 were due to cancer of the colon perforating into the stomach; 19 to jejunal ulcer following posterior gastroenterostomy. Fistulae in cases of carcinoma of the colon or stomach, Verbrugge notes, are part of the tumor itself. They are lined with tumor cells.

The most characteristic symptoms of gastrocolic fistula are diarrhea, foul eructations and vomiting of fecal material. Pain is not a usual symptom. Of the 21 cases from the Mayo Clinic, roentgenographic examination was made in 20. The findings were definitely positive for fistula in 11, doubtful in 1, and negative in 8. A clinical diagnosis was made in 13. Seven cases not diagnosed clinically were also not diagnosed by the roentgenographic examination.

Kuttner[2] in 1926 and Jansson[3] in 1928 both noted that roentgenologic diagnosis of gastrocolic fistula can sometimes be made by the use of the opaque enema, when the opaque meal fails to show the condition. By means of the enema, the fistula may be clearly demonstrated and the stomach may be seen to fill rapidly from the colon.

Recent case reports (since 1924) relate chiefly to gastrocolic fistula due to jejunal ulcers following gastroenterostomy. The following cases after carcinoma of the colon are reported:

Dickson[4] in 1928 reported 6 cases of gastrocolic fistula from the Toronto General Hospital, 2 of which were secondary to carcinoma of the colon:

> In 1 case, the patient was a man fifty-two years of age, who, on admission to the hospital, was pale and sallow and complained of diarrhea alternating with constipation. He had had attacks of vomiting for the preceding two weeks, and more recently the odor of the vomitus had become fecal. A barium enema showed that the sigmoid and descending colon filled quickly. There was a circular filling defect in the transverse colon about 3 inches proximal to the splenic flexure. A fistula was demonstrated passing from the upper limit of this defect, through which the stomach was quickly filled. A diagnosis of gastrocolic fistula secondary to carcinoma of the colon was made. Operation was refused, but the diagnosis was later confirmed at autopsy.

* Submitted for publication October 19, 1929.

In the second case, that of a man forty years of age, the patient showed loss of weight, weakness, diarrhea and vomiting. These symptoms had been progressively increasing for the preceding six months. The vomitus was of the fecal type. A barium enema showed a filling defect in the same region as in the previous case. A definite fistula was demonstrable. It entered the posterior wall of the stomach. A second fistula was found passing into the jejunum. Laparotomy was done, but no repair was attempted, because of the patient's condition. Death occurred within six hours after operation. Autopsy confirmed the diagnosis of carcinoma of the transverse colon with gastrocolic and jejunocolic fistula.

FIG. 1.

Brock[5] in 1928 noted that a large majority of cases of gastrocolic fistula follow perforation of a jejunal ulcer after gastrojejunostomy. The second leading cause is malignancy of the stomach or colon. Although gastrocolic fistula is a rare condition, 4 cases were seen by Brock in rapid succession at Guy's Hospital, London. Three followed gastrojejunostomy and 1 a growth of the transverse colon.

In the latter case, the patient was a man thirty-nine years of age. For three months prior to admission to the hospital, he had lost weight and strength. During this period he had an attack of diarrhea. He had vomited occasionally, the vomitus consisting of undigested food eaten two or three days earlier. Belching of foul gas was also a troublesome symptom. There was no pain, abdominal distention or palpable tumor. The vomiting and belching ceased soon after admission to the hospital. Samples of the vomitus and feces were identical in appearance, both being rancid, dark and fluid, and containing a little solid matter. Roentgenologic examination with an opaque meal showed a communication between the pyloric vestibule and the transverse colon. One opaque enema showed a dilated colon with the fluid passing as far as the middle of the transverse colon and then flowing into the stomach. At operation, the fistula was found; also, secondary carcinomatous nodules on the peritoneum. No attempt was made to excise the fistula. The patient died from bronchopneumonia twelve days after operation. At operation it could not be definitely decided whether the primary growth was in the stomach or in the colon, but at autopsy a large carcinoma of the transverse colon, which had ulcerated into the stomach, was found.

Brock notes that, including the 4 cases reported by him, there are records of 10 cases of gastrocolic fistula at Guy's Hospital. One case, that already reported in detail, followed carcinoma of the colon; 1, gastric carcinoma; and the others, jejunal ulcer resulting from gastrojejunostomy. Brock states that when gastrocolic fistula is due to carcinoma of the stomach of colon it is usually associated with advanced malignancy; but the history may be relatively short and obscure, as in his own case, in which no metastases were found except the secondary nodules on the peritoneum.

REPORT OF CASE

Mrs. E. L., aged forty-nine, was referred to me by her family physician in February, 1929, because of the presence of a definite mass in her abdomen. Her chief complaint was pain in the right shoulder. The family and past personal history was negative, and the present illness was of only four weeks' duration. However, her weight had fallen from 155 to 140 lb. in three months.

The patient was well nourished and seemed to be in good general health. Her breath was

extremely fetid, much more so than could be accounted for by a condition of oral sepsis. It suggested deep-seated putrefaction in the gastrointestinal tract.

There was a definite movable tumor in the left upper quadrant of the abdomen. The diagnosis of a neoplasm was confirmed by roentgen-ray study, which revealed an extensive filling defect in the distal portion of the transverse colon and a fistulous connection with the greater curvature of the stomach. This condition is shown in the accompanying roentgenogram.

Examination of the gastric contents gave normal figures for free hydrochloric acid and combined and total acidity. Lactic acid was negative and no Boas-Oppler bacilli were found.

Hemoglobin was 75 per cent and the red blood cell count in proportion. The urine was negative. Several blood pressure readings showed slight hypotension.

On February 27, 1929, laparotomy was performed at the Mt. Sinai Hospital by Dr. A. A. Berg. His findings corroborated the clinical and roentgenologic diagnosis: There was an adenocarcinoma of the colon with suppuration and a fistulous connection with the stomach through the gastrocolic ligament.

Operative finding: Large tumor in the transverse colon. This tumor had perforated into the mesocolon and omentum. It was adherent to the peritoneum and had ruptured into the stomach, with the resulting formation of a gastrocolic fistula. The colonic tumor was resected after its complete mobilization. The involved portion of the stomach was excised, and end to end anastamosis of the colonic ends and a repair of the defect in stomach was made.

There was an uninterrupted convalescence, the wound healed kindly, and the patient was discharged from the hospital about seven weeks after the operation.

COMMENT

In my opinion, this case represents primary adenocarcinoma of the colon, for the following reasons:

1. The carcinomatous involvement of the colon predominated considerably over that of the stomach.

2. The course of migration of the opaque medium was obviously from the colon to the stomach. After a barium meal, the tortuous opaque streak revealing the fistula was not observed. However, this finding was apparent after a barium suspension enema when the medium was introduced under pressure.

3. The absence of symptoms referable to the stomach and the normal findings on analysis of the gastric contents indicate the absence of any considerable glandular involvement of the stomach.

To my mind, the extremely short duration of the illness in this case was more apparent than real. Patients of this type have a tendency to minimize their symptoms so as to obscure the real course of the malady. A fistulous tract connecting two adjacent organs through neoplastic tissue could not have been formed in so short an interval as the history might suggest.

The marked fetor oris is apparently to be ascribed to the condition of tissue breakdown associated with the fistulous tract. This case illustrates the general rule that roentgen-ray study is the only means by which exact preoperative diagnosis can be made in cases of gastrointestinal neoplasm and surgical intervention may thereby be rendered less speculative.

SUMMARY

Gastrocolic, or cologastric, fistula is a rare condition. Two hundred sixteen cases were reported up to 1924. In most instances the disturbance is a sequel of posterior gastroenterostomy for jejunal ulcer. It may result from malignancy of the stomach or, as in the case reported, from carcinoma of the colon.

In the case reported, the condition should be called cologastric fistula, because the malignant growth originated in the colon and formed a fistulous tract leading through the gastrocolic ligament to the greater curvature of the stomach. The case occurred in a woman, aged forty nine, who had a definite movable tumor in the left upper quadrant of the abdomen. Roentgenographic examination after an opaque enema under pressure clearly indicated that the course of the fistula was from the colon to the stomach. The findings were confirmed at operation.

[Note: For references see author's reprints.]

MODIFICATION OF THE UNGER APPARATUS

FOR BLOOD TRANSFUSION*

HENRY S. MARTIN, M.D., F.A.C.S.

WARSAW, N. Y.

DURING the past few years several modifications of the Unger apparatus for whole blood transfusion have made their appearance. Most of these changes have not resulted in an appreciable increase in the efficiency, dependability or ease in manipulation of the apparatus.

The apparatus designed by Dr. L. G. Unger of New York City has been, for several years, the favorite apparatus of many surgeons who perform a considerable number of transfusions and who have mastered the technic of its use. In their hands, the method is very dependable. The technic is simple and any desired amount of blood can be transfused with ease and rapidity. However, many competent surgeons who perform a very few transfusions each month, are frequently confronted with at least an occasional failure. In many localities it is unjustly regarded as an impractical instrument.

As regards the original Unger apparatus per se, the principal causes of transfusion difficulties and failures are:

1. The sticking of the Record blood syringe due to the thin film of blood which gradually forms between the plunger and the barrel. This sticking is favored by the unequal heat expansion of the metal and glass and also by the small outlet of the syringe.

2. The small bore of the stopcock connections and of needle adapters retarding the ready flow of blood. Partial clotting is thus more likely to occur with resulting difficulties of withdrawal and injection of blood.

3. The Record blood syringe breaking as a result of falling from the stopcock.

4. The entrance of blood into the saline solution.

It is obvious that the above difficulties could be largely eliminated by:

1. Using a blood syringe having the barrel and plunger of the same material and a larger outlet.

2. Increasing the bore of the stopcock connections and of the needle adapters.

3. Using a bayonet lock connection for the blood syringe.

4. Practically eliminating saline solution.

The apparatus presented here has been satisfactorily used for one hundred transfusions at the Wyoming County Community Hospital. An attempt has been made to eliminate the causes for occasional failures. It is believed that the changes mentioned below have resulted in a more efficient and dependable instrument especially in the hand of the occasional operator.

A Record syringe is used for the injection of saline instead of a glass Luer syringe. Between its connection and the four-way cock, a one-way cock is placed. With one hand the assistant can easily turn the one-way cock and refill the syringe with saline, thus having his other hand free for other assistance such as holding an infant's arm, etc. In case the blood syringe is broken this Record syringe may be used as a substitute by inserting an adapter.

The transfusion syringe designed by Dr. John M. Scannell of Brooklyn is used for withdrawing and injecting blood, instead of a Record syringe. As it is constructed chiefly of glass, sticking of the plunger is lessened. It has a large outlet and is connected to the four way stopcock by a strong bayonet lock. As the metal ring of the Scannell syringe was unnecessary, it was removed. By means of an adapter, this syringe may be used for the injection of saline in case the Record syringe is broken.

* Submitted for publication October 19, 1929.

The bore of all parts (saline connection excepted) of the four-way cock and of the two needle adapters was increased to 2.5 mm. The metal disks of these adapters were increased to 11 mm. to permit a better grasp should the necessity arise of changing the rubber tubing during the course of a transfusion.

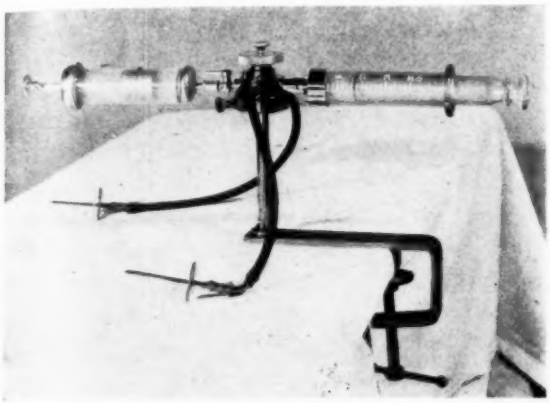


Fig. 1. Apparatus assembled.

When the transfusion is underway satisfactorily the use of saline solution is discontinued. The use of ether spray upon the blood syringe to retard the clotting time and the expansion of the syringe is not objectionable when employed as a very fine spray. The increased bore of the apparatus and the use of the Scannell syringe have practically eliminated the necessity for saline solution and ether except in unusual cases where the actual transfusion time is prolonged.

The apparatus is very satisfactory whether used in the operating room or in the patient's home. It is perfectly adaptable to the method of blood transfusion as advocated by Dr. O. A. Brines of Detroit.

Fig. 2. Apparatus in case.

By the Brines method both syringes are used for withdrawing and injecting blood. A physician or nurse assistant is desirable but not essential to the complete success of the transfusion. A compact wooden case was constructed to house the complete outfit. In the upper half of the case there is ample space for instruments necessary for transfusion.

CARGILE MEMBRANE IN PREVENTING INTRA-ABDOMINAL POSTOPERATIVE ADHESIONS*

GEORGE S. FOSTER, M.D.

MANCHESTER, N. H.

POSTOPERATIVE adhesions are surely a curse to be avoided when possible. How many times we have seen cases of clean abdominal surgery that months after the operation returned complaining of that dull, dragging pain beneath the site of operation, marked constipation and a certain degree of disability.

A careful and thorough physical examination of these cases revealed no new pathology except the possibility of adhesions. Roentgenograms shows that the intestinal tract was bound down, kinked or twisted in certain areas adjacent to the field of operation. This in itself accounts for all of the signs and symptoms found and thus the diagnosis of postoperative adhesions is made.

Few, if any, of these cases reacted satisfactorly to any form of medication or non-surgical treatment. If observed over a long period they would remain about the same. Finally in some instances a secondary celiotomy was advised.

On the table these cases reveal in fact the conditions shown by the roentgenogram. This fact we have faced several times, some of the cases having been previously operated upon by ourselves and some coming from other hospitals. A careful study of these cases during the past ten years has brought into use in our clinic the introduction of Cargile membrane for use in these cases as a preventative of the reoccurrence of these adhesions following their release and the return of the intestines to their normal position and contour.

In the first few cases of its use we found that very satisfactory relief was obtained without the return of the signs and symptoms previously noticed. Carefully observing these first few cases over a period of one to three years we were quite convinced that the use of Cargile membrane as a routine in covering over any intra-abdominal raw areas left after the operation was completed was satisfactory in preventing these postoperative adhesions.

Again we collected quite a number of cases that had been previously operated upon by ourselves or in other hospitals for an intra-abdominal purulent condition where longer or shorter drainage was necessary to save life. Of course, we would naturally expect these cases to yield multiple intra-abdominal adhesions and later on give the consequent signs and symptoms. In this class of cases we naturally found many more as well and more firm and completely organized adhesions which when released at the secondary celiotomy left many more or less extensive raw surfaces. In this class of cases we also introduced the Cargile membrane to cover over these raw surfaces and found that the results were very satisfactory. In observing this type of case over a period from one to three years we found that the relief to the patient of previous signs and symptoms was most gratifying.

Thus we have by gradual steps come to use Cargile membrane as a routine in all intra-abdominal surgery where even the smallest raw surface is left as a possible modus for the later attachment of the intestine to this surface. This routine we have had in action now for about five years and the cases that return to us with signs and symptoms of postoperative adhesions are very few. In fact, we have had no complaints. Our system now in vogue has as a part the follow-up report covering a period of two years. Thus we can check up fairly accurately.

* Submitted for publication, March 10, 1930.

Of course, it is understood that in the cases which come to us with a purulent intra-abdominal condition cannot, at the first sitting, have the Cargile membrane used as it is directly contraindicated. As a matter of fact when used it very early dissolves by chemical, bacterial action and within a few days has disappeared. So, when it is used in these cases, does no good. In this class of cases we warn the patients, when discharged from the hospital, of the possibility of further trouble from postoperative adhesions and recommend that they return at the end of a two-year period for a complete observation and investigation to determine the presence or absence of any postoperative adhesions and the presence of any signs or symptoms as a result of such. If found present and giving any discomfort, we advise readmission for a secondary celiotomy and correction, using the Cargile membrane at this time. By following out this routine and instituting the relief operative measures we find that very satisfactory results are obtained.

In clean intra-abdominal cases such as hysterectomy, cholecystectomy, intestinal resection, strangulated or incarcerated hernias, gastroenterostomy and the like, we always use the Cargile membrane to cover all suture lines and raw surfaces. Thus are prevented coils of intestine from adhering to the raw points in the pelvic floor, the duodenum or pylorus from adhering to a suture gall bladder area, and other intestinal loops from adhering to a suture line in a gastroenterostomy or an entero-enterostomy.

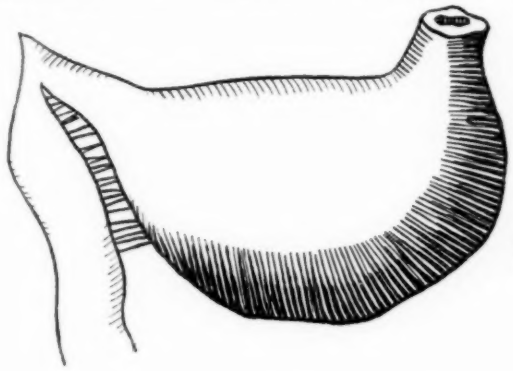


Fig. 1. Showing kink in duodenum secondary to adhesions.

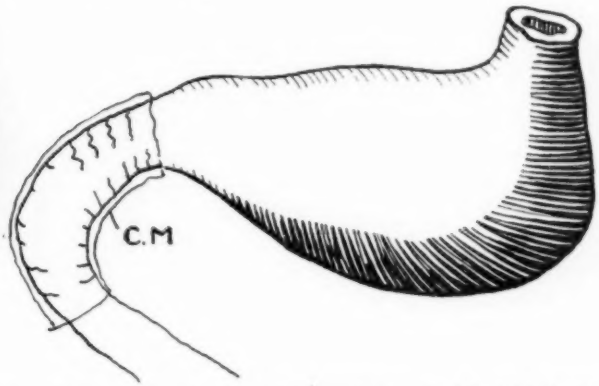


Fig. 2. Showing cargile membrane C. M. folded about raw area of duodenum.

Another type of case which is very apt to give a most tantalizing aftermath is found in that thick, heavy, pendulous, superfluous fat abdominal wall where because of its weight a constant pressure is exerted upon the abdominal wound closure suture line and the intestinal coils which are very apt to adhere to this closure line. Here the Cargile membrane plays a most important part when used to cover over the intra-abdominal contents just below the closure line of sutures. A double layer of Cargile membrane placed along this area will prevent any anterior wall adhesion of the intra-abdominal contents and give a most satisfactory outcome in these overweight cases.

At times one will find it quite impossible not to have raw areas of a more or less extensive nature even in those clean, intra-abdominal cases. Especially is this true where a very extensive resection of any part was to be accomplished in a very thin individual. Here we do not have any alternative as there is practically no fat to use for at least partially covering over these raw surfaces. Next to Cargile membrane and perhaps first in some instances, fat is our best friend and ally for this purpose. However we must always consider the fact that fat from any intra-abdominal region is already anatomically and normally basally attached to some

intra-abdominal organ or organs and thus, even if advantageously used, will always have the possibility of partial absorption and later contraction, producing that drag and weighty pain so frequently complained of in these postoperative adhesion cases. The use of Cargile membrane eliminates this possibility.

TECHNIC IN ITS USE

The application of sheets of Cargile membrane requires the adherence to certain fundamental principles. Two things are absolutely necessary: an operating-room instrument nurse who has been carefully trained in the handling of this membrane from its release from the envelope to the delivery to the operating field, and an assistant who fully cooperates and understands the instrumental handling of this membrane and its application as well as does the operator. These two fundamentals are absolutely essential for the successful application of the Cargile membrane in proper position with a guaranteed sterility. Every aseptic precaution must be executed to the last degree by the instrument nurse. There is one other thing: Cargile membrane should never be moistened the least particle prior to its application.

In handling Cargile membrane we have found that smooth tissue forceps with a very fine grasping bill serves best. The assistant with his forceps grasps one corner and the operator with his forceps grasps the direct-line opposite corner. The field is widely retracted and the contents fully exposed in proper positions. The grasped, taut edge is applied first and released, and the two direct-line opposite corners of the Cargile sheet are picked up in the forceps and the membrane sheet slowly bound over the raw surface or about the suture line. This is a very important point in its application and if cooperatively carried out will permit of a smooth, unwrinkled application of the membrane. The warm, moist surface of the part to be covered will very greedily adhere to the membrane, thus covering it over and fully protecting it.

A great deal of patience is required in carrying out this technic which in itself is simple enough if these few rules are followed. At times, especially when a very freely movable wall comes adherent to the area covered, a second layer of this membrane placed directly over the first one will further enhance its usefulness.

Of course, it is understood that any surface must be very carefully sponged free of blood, blood clots or serum, prior to the application of Cargile membrane. Following its application all packed-off abdominal contents or retracted structures are very carefully released and permitted to very slowly and under guidance assume their normal positions. This part of the procedure requires very painstaking movements.

Once the Cargile membrane has been properly and smoothly coapted over the area or about this part, it is pretty apt to maintain its position quite firmly. The closure of the wound is then accomplished and dressed as usual.

One additional precaution, which it is fairly reasonable to observe in all cases, seems worthy of note especially in intestinal surgery: that is, splint the bowel with some form of hypodermic injection for the first twelve to twenty-four hours. By the first six hours the Cargile membrane has become quite a firm part of the surface upon which it has been placed and a little extra time allowed prevents any dislodgment by hyperperistalsis.

Cargile membrane therefore has a wide field of usefulness with a most satisfactory ending in so far as postoperative adhesions are concerned. For ourselves we have learned to believe in it greatly and we use it very extensively in this way, thus very largely eliminating those signs and symptoms previously seen as the result of postoperative adhesions.

SCARLET FEVER

FOLLOWING ABDOMINAL OPERATIONS*

J. P. GREENHILL, M.D., F.A.C.S.

CHICAGO, ILL.

SCARLET fever which follows an operation, a wound or a burn is spoken of as surgical scarlet fever. This condition is not uncommon and a large number of such cases have been reported in the literature. However, it is surprising how few are the case reports of surgical scarlet fever which follow abdominal operations.

The first description of a scarlatiniform eruption occurring after operation was recorded by Civiale[1] in 1858. In the same year Sée[2] reported a case where a generalized eruption resembling scarlet fever developed after an operation. However, neither of these authors believed he was dealing with scarlet fever. The credit for reporting the first case of surgical scarlet fever is generally given to Sir James Paget[3] who in 1864 gave a clinical lecture on surgical scarlet fever following operation. His first case occurred in a boy who had a stone removed from the bladder:

> The boy, lately operated on for stone had scarlatina . . . Two days later it began to fade and in a few days had disappeared . . . All went on well for a month, the wound was nearly healed when he had severe pain in passing urine and evacuated with it a considerable quantity of blood from the kidneys . . . Two days after this, he had sore throat, then an eruption like scarlet fever again appeared. It continued for three days and was succeeded by desquamation. The urine in about ten days had gradually regained its natural condition . . .
>
> If I had never seen a case similar to this, I should have hesitated to call it scarlatina; for the symptoms of the first attack were very incomplete and those of the second were unusual and disorderly. But I believe the case was really one of scarlatina modified by the circumstances in which it occurred . . .
>
> About this time last year when scarlatina was very prevalent, I saw six cases after operations in private practice. I have notes of four more that occurred either before or since and I have heard of many more. By some these cases may be supposed to have been only casual coincidences of scarlatina with surgical diseases; but, if they were so, we ought to find a proportionate number of cases among surgical patients not operated on. But this does not happen. In private practice, I do not remember to have seen scarlatina supervene in any surgical cases except those in which operations had been performed; and, in hospital practice, I doubt whether it is much more frequent among all the other patients taken together than it is in those who have been operated on. I cannot, therefore, doubt that there is something in the consequences of surgical operations which makes the patients peculiarly susceptible of the influence of the scarlatina poison. And, together with this susceptibility, we may observe that the disease undergoes in them certain modifications, especially in the period of incubation, which is much shortened. In all the ten cases I have noted, the eruption appeared within a week after the operation . . . Other deviations from the typical course of scarlatina were, that in some of the cases the eruption came out over the whole surface at once, and on the limbs more fully than on the face and chest; in some, there was no sore-throat; in others no desquamation.
>
> The cases are not numerous enough to determine the import of these variable deviations from the type of scarlatina; but that in which all of them, whether complete or incomplete in other characters, agreed, namely, the very early period after the operation at which the rash appeared, deserves particular notice. It adds to the evidence, that the appearance of scarlatina is in some way connected with the early consequences of operations. If it were not so, and if patients after operations had only the same liability as others, there would be no reason why the eruption should appear early, rather than late, after the operation; but, as far as I have seen, it always appears early—always within the first week.
>
> Two explanations may be offered of this

* Submitted for publication December 31, 1929.

fact. Either the condition induced in a patient by a surgical operation is one that gives a peculiar liability to the reception of an epidemic or contagious morbid poison, and any one of these, being imbibed immediately after the operation, produces its specific effect in much less than the usual period of incubation; or else those who suffer with scarlatina within a few days after operations had previously imbibed the poison, but would not have manifested its effects so soon, if at all, unless their health had been exhausted or disturbed. The second of these explanations appears rather the more probable; for it is in accordance with what has been observed when many persons have been exposed to the contagion of fever, and some have been afterwards exhausted by fatigue or otherwise. These have had fever; while those who rested after exposure have escaped it.

But, whatever explanation may be given, the fact of peculiar liability to scarlatina after operations seem certain, and may be important in relation both to the pathology of the disease and to the risks of surgery. In one of the cases which I have seen, it was fatal; in another, it was followed by fatal pyaemia; and I think it not improbable that, in some cases, deaths occurring with obscure symptoms, within two or three days after operations, have been due to the scarlet fever poison hindered, in some way, from its usual progress.

Immediately following the publication of Paget's lecture a number of cases of surgical scarlet fever were reported.

In 1881 at the International Medical Congress in London, Riedinger[4] and Marsh[5] read papers on surgical scarlet fever. In 1882 Batut[6] wrote a thesis on this subject and his belief was that there was no relationship between trauma and scarlet fever but that the association was simply a coincidence.

In 1887 Hoffa[7] wrote a critical review of the literature on surgical scarlet fever. He rejected most of the reported cases and accepted only those cases in which the eruption began in the wound. This author divided the eruptions which follow surgical operations into four types: (1) a vasomotor disturbance due to irritation of the sensory nerves and evidenced by a transient urticaria or erythema; (2) a toxic erythema due to absorption of aseptic pyrogenous material from the traumatized area; (3) an infectious rash which occasionally occurs in septicemia or pyemia and is due to minute emboli composed of bacteria which lodge in the capillaries, and (4) true scarlet fever with the usual symptoms and complications, the microorganisms having entered by way of the wound and the eruption often beginning at the edges of the wound.

In 1902 de Bovis[8] exhaustively reviewed the literature and collected 150 cases but in his analysis he made use of only 100 cases because the others had insufficient clinical data. But even in the selection of these 100 cases, he was very liberal. He believed there were five points of difference between surgical and medical scarlet fever, as follows: In surgical scarlet fever a larger proportion of adults are attacked, there is slight or even absent angina, a short period of incubation, the eruption starts in or near the wound and desquamation occurs early or may be absent.

The last extensive review of the subject was made by Hamilton[9] in 1904. Her analysis covered 174 cases collected from the literature and to these she added 10 new cases. The whole subject was thoroughly discussed and the literature carefully analyzed in her paper. She stated that de Bovis' five points of divergence of surgical from medical scarlet fever are points in the diagnosis of erythema scarlatiniforme. The latter eruption when caused by toxemia or septicemia may come on a few hours after an operation of any kind or at any time in a long-continued suppurative disease. Hamilton points out that it is difficult to find two authorities who entirely agree on the cardinal symptoms which must be present to make a diagnosis of scarlet fever. The rapid onset of the symptoms, the early appearance of a characteristic rash, first on the chest and neck, then rapidly be-

coming general, the angina, the swelling of the lymphatic glands, the nephritis and the desquamation make up the typical picture of scarlet fever. But there are real cases of scarlet fever without fever, rash, angina, swelling of the glands, or nephritis. Desquamation, which is a late symptom, may be scanty or atypical, and even if it is characteristic it proves very little, because it follows other eruptive diseases also, such as erysipelas and erythema scarlatiniforme. Because of the great variability in the symptomatology of scarlet fever it may be difficult to differentiate scarlet fever from other diseases. The most common afflictions which give rise to confusion are sepsis and pyemia, erysipelas, the rash occasionally seen in diphtheria, especially in case of mixed infection with pus organisms, rashes due to posioning by drugs and erythema scarlatiniforme. The latter disease is "a febrile affection occurring idiopathically or in association with septicemia, pyemia, autotoxemia, or drug or food posioning, its most distinguishing features being the scarlatina-like eruption, the non-contagiousness and the tendency to recurrence."

According to Hamilton it seems justifiable to rule out as unproved all those cases in the literature of surgical scarlet fever in which the presence of toxemia or septicemia was highly probable and in which the symptoms deviated from those of typical scarlet fever but not from the symptoms of toxemia or septicemia. In the cases where the disease was undoubtedly scarlatina, Hamilton maintains "there is no convincing evidence that the relation between the wound and the scarlet fever was anything more than one of coincidence." "There is as yet no convincing proof in the literature that surgical scarlet fever is anything more than scarlet fever in the wounded."

In an article on Scarlet Fever in Abt's "Pediatrics," Weaver[10] mentions that there were 27 cases of surgical scarlet fever among 2595 cases of scarlet fever in the Durand Hospital (Chicago). He is of the opinion it has not definitely been shown that scarlet fever is more readily contracted by persons with wounds than others. The virus of scarlet fever may be introduced into the body through wounds and it would be proper to limit the term surgical scarlet fever to such cases. Weaver[27] believes that in some cases in which the infection enters through wounds, there seems to be quite a long period before general infection occurs and clinical scarlet fever develops.

REPORTED CASES FOLLOWING ABDOMINAL OPERATION

In spite of the extensive literature which has accumulated since Paget's first report in 1864 I have been able to collect from the literature only 32 cases of scarlet fever which followed abdominal operations. Certainly many more cases have occurred and have been recognized but they have not been reported. On the other hand, a few cases, as for example the first one listed below, cannot definitely be considered as cases of surgical scarlet fever because the clinical data are insufficient. They are, however, included because the authors may have had good reasons for reporting these cases as surgical scarlet fever. Brief abstracts of the cases described in the literature follow:

1. Paley and Goodhart,[11] 1879. A boy, aged four, was operated upon for a hernia on July 2, 1875. On July 25 his temperature rose to 101°F., he was drowsy, had a furred tongue, tonsillitis, swelling of the submaxillary glands and a uniform red rash on the legs. The wound looked clean and the child was much better on the twenty-seventh. There was no note concerning desquamation or albuminuria. Seven months later the child had an attack of measles.

2. P. Bollici,[12] 1890. On October 6, 1888 a bilateral salpingo-oophorectomy was performed. The patient had a normal temperature until the sixth day when high fever was noted and she had abdominal pain, headache, anorexia and burning sensation in the wound. However, the latter looked clean. An erythema was observed on the inner surface of the leg

and over the left lower quadrant of the abdomen. On the eighth day, the limbs and face were involved and blisters formed. The temperature decreased and by the sixth day after the appearance of the eruption, desquamation was progressing rapidly. It was found necessary to drain the lower angle of the wound.

3. Salomoni,[13] 1893. A Bassini operation was performed for left-sided inguinal hernia and on the morning following the operation an eruption was found around the incision. Later it was localized over the lower left quadrant of the abdomen and the upper part of the thigh. During the following days it spread. High temperature persisted for three days and there was oozing from the wound. Recovery was complete after eighteen days.

4. McGraw,[14] 1895. A boy, aged fifteen, who had had scarlet fever when he was eight years of age, was operated upon for gangrenous appendicitis with abscess formation. The appendix was removed and a rubber drain left in the abdomen. Five days after operation the patient had a chill and fever. The following day the temperature was 102°F., the throat was sore and there was a generalized scarlet rash. The tongue developed the regular strawberry appearance seen in scarlet fever. The boy vomited considerably but the abdomen was flat and free from tenderness. The wound was clean. Fever persisted until death. At autopsy the cause of death was found to be volvulus.

5. Moeller,[15] 1902. A nine-year-old girl was operated upon for bilateral inguinal hernia. Because the child was anemic, and had a persistent cough, each hernia was operated upon separately. The first operation was performed on October 21, 1901 and the wound healed by first intention. The second operation was done on November 6. On the evening of the third day following the latter operation, high fever was observed, the child was stuporous and her body was scarlet red. Tonsillitis was found the next day and a scarlatiniform eruption appeared on the chest. The tongue assumed the raspberry aspect characteristic of scarlet fever and the eruption spread all over the body. On the seventeenth day desquamation occurred. Both wounds remained clean but on one side the edges separated.

6. Martin,[16] 1903. A woman, aged thirty-eight, who had had scarlet fever at the age of fourteen, had an appendectomy performed on April 3, 1901. On April 5 the pharynx, mouth, tonsils and tongue showed a raspberry color, the patient had frequent fits of coughing and she had high fever. An exanthem appeared first on the neck and soon covered the entire body. On April 8, pus was obtained from the wound and on the tenth desquamation commenced. A large amount of albumin was found in the urine. By April 20 the desquamation was complete. The wound was not entirely healed until two months after operation.

7. Gerasimovich,[17] 1903. On a six-year-old child an operation for right inguinal hernia was performed on February 23, 1902. The next day fever developed and this increased gradually. On the twenty-sixth, the wound was found to be reddened, infiltrated and slightly purulent and on the twenty-seventh a pale pink eruption appeared. The pharynx was hyeremic and the tongue furred. On March 1 the characteristic tongue of scarlet fever was observed and the pharynx was red. The patient was transferred to the scarlet fever ward. Desquamation began March 9 and on the fifteenth there was an inflammation of the middle ear which subsequently cleared up. Staphyloccoci were recovered from the blisters around the wound, streptococci from the pus in the wound and diplococci and streptococci from the pharynx.

8. Gerasimovich, 1903. A child, aged one year and eight months, was operated upon for inguinal hernia on April 25, 1902. Fever developed four days after operation and a pale pink scarlet fever eruption appeared on the body. On May 1 the wound was found to be suppurating. The following day the characteristic tongue of scarlet fever was noted and there was high fever. The patient was transferred to the scarlet fever ward. On May 9 desquamation commenced. The wound closed after having drained a long time. Diplococci and streptococci were recovered from the pharynx and saprophytic bacteria from the wound.

9. Nicolotti,[18] 1904. A herniotomy was performed on a boy nine years old and on the following morning there was slight fever, tachycardia, a coated tongue and a reddened throat. The next day an eruption was seen all over the lower part of the abdomen and around the wound. The eruption spread to the thorax and back. On the sixth day desquamation began. The wound healed per primam.

10. Bernard,[19] 1906. An operation for the cure of an inguinal hernia was performed

on a six-year-old child. The herniated mass consisted only of the appendix which was adherent to the sac of the hernia. One week after operation the patient developed high fever and a pronounced case of scarlet fever manifested itself. The wound was probed and thick pus escaped under pressure. It was ascertained that there were a number of cases of scarlet fever at the school which this child attended.

11. Davidovitsch,[20] 1908. On September 25, 1894 a twenty-six-year-old woman had a ventrofixation of the uterus. On September 28 there was fever and dysphagia. Eight days after operation the wound was found to be slightly infected. The skin was red, the tongue presented the characteristic appearance seen in scarlet fever and there was slight conjunctivitis. Desquamation took place and the patient left the hospital October 2.

12. Davidovitsch,[20] 1908. A thirty-year-old patient was operated upon for bilateral hernia on February 18, 1902. Two days later a scarlatinal rash was observed over the entire body. The wound healed by primary intention. Desquamation occurred and on May 6 the patient left the hospital.

13. Davidovitsch,[20] 1908. A woman, aged forty-five, had a ventrofixation performed the latter part of February, 1902. Shortly after operation there was high fever, dysphagia and a diffuse scarlatinal rash all over the body. The tongue and throat were coated. The urine contained albumin from March 15 to 31. The patient was discharged May 20.

14. Davidovitsch,[20] 1908. A patient, aged twenty years, was operated upon for appendicitis April 10, 1905. On April 15 she had severe pain in the throat, headache and a rash over the entire body. The face was dark red, the right tonsil swollen and coated and the cervical glands swollen. Desquamation occurred and the patient was discharged June 13.

15. Davidovitsch,[20] 1908. A woman, aged thirty-six, had an Alexander-Adams operation on July 8, 1905. On the eighth postoperative day there was fever, difficulty in swallowing and a scarlatinal erythema over the entire body. The face and cheeks were very red; the tongue was reddened at the edges and the papillae were raised. The throat was red and swollen but not coated. There was albumin in the urine for five days. Desquamation occurred in large pieces. The wound healed normally and the patient was discharged August 28.

16. Davidovitsch,[20] 1908. A forty-three-year-old woman had an anterior and posterior colporrhaphy and an Alexander-Adams operation on July 15, 1905. On July 20 fever and a scarlatinal rash over the entire body were noted. The face and tongue were red, and the throat was likewise red and swollen but not coated. There was slight suppuration of the wound. Desquamation occurred and the patient was discharged on August 25.

17. Davidovitsch,[20] 1908. On September 25, 1905, a laparotomy was performed for myomata of the uterus. Three days later there was an elevation of temperature and on the seventh day a scarlatinal exanthem was observed on the chest. The tongue was coated, the tonsils were normal, and there were no glandular swellings. The wound was found to be infected. The fever lasted five days. Desquamation occurred and the patient left the hospital on November 16.

18. Davidovitsch,[20] 1908. A girl, aged sixteen years, was admitted to the hospital March 27, 1906. She had had two operations for hematosalpinx, the first three weeks before admission, and the second two weeks later. Immediately after the latter operation, there was high fever, difficulty in swallowing and a scarlatinal rash. The tongue and throat were fiery red and there was albumin in the urine. Desquamation occurred and the patient was discharged on May 14.

19. Davidovitsch,[20] 1908. A girl, aged eleven years, had a herniotomy on April 8, 1907. Four days later fever and a rash were present and the patient complained of a sore throat and headache. The tonsils were enlarged and red, and the submaxillary glands were swollen. Desquamation took place. The wound healed per primam and the patient left the hospital May 10.

20. Roberts,[21] 1915. A twenty-seven-year-old woman had her appendix removed and made an uneventful recovery until the ninth day postoperative when there was a rise in temperature and a sore throat developed. Two days later an eruption appeared over the neck, chest, arms and back. A diagnosis of scarlet fever was made and the patient was sent to the scarlet fever pavilion of a contagious hospital. She made a complete recovery.

21. Port,[22] 1922. A boy aged two and one-half years was admitted to the hospital on July 30, 1918. Eight days previously he had been operated upon for an inguinal hernia.

At the time of admission the temperature was 104°F. and there was a typical scarlet fever exanthem over the entire body. On August 14 there was extensive desquamation. On August 25 the child, although still desquamating, was discharged upon request of the parents. The wound healed by first intention.

22. Port, 1922.[22] A twenty-seven-year-old man had an appendectomy September 27, 1927. On October 3, he developed high fever and headache. The next day there was pronounced redness on the neck, limbs and face, and on the following day angina developed. A glass drain was inserted into the wound. On October 16 there was extensive desquamation. By October 25 the wound was closed but desquamation continued until November 12.

23. Port, 1922.[22] From a patient, aged nineteen years, the appendix and an ovarian cyst were removed on April 16, 1917. The next day she developed signs and symptoms of scarlet fever and was transferred to the contagious ward. On April 20 the scarlatiniform rash extended all over the body. On May 15 there was extensive desquamation. The patient was discharged on June 2 after the wound had been completely closed for one week.

24. Port,[22] 1922. A two-year-old girl was operated upon for a hernia February 14, 1917. The following day she developed fever and a light red exanthem on the neck and limbs. The throat was red. On February 28 the wound was found to contain pus. On March 11 there was desquamation. The patient was discharged April 4.

25. Günther,[23] 1924. A fifteen-year-old boy was operated upon for appendicitis and diffuse peritonitis. Drainage was instituted. Four days after operation there was high fever and nausea. The following day a scarlet fever eruption appeared on both flanks and soon spread over the entire body. Angina also appeared and desquamation began fourteen days after operation. The wound healed rapidly.

26. Floris,[24] 1927. A woman, aged thirty-two years, had a subtotal hysterectomy and bilateral salpingo-oophorectomy for suppurating fibroids. The operation was performed under lumbar anesthesia on September 11, 1926. On the fourth day after operation a red eruption, scarlatiniform in character, appeared on the neck, thorax and back. There was pyrexia and tachycardia and the throat was reddened. Signs of hyperthyroidism were evident. The following day, the eruption became generalized. Desquamation followed but the signs of hyperthyroidism persisted. The patient left the hospital on October 25, but returned the following January with symptoms of malignancy in the lungs. She died February 1. Subsequent careful examination of the fibroids removed at the operation revealed sarcomatous degeneration.

27. Rivaroli,[25] 1927. A man was operated upon October 1, 1926 for suppurating hydated cyst of the liver. He developed scarlet fever on the third day after operation.

28. Rivaroli,[25] 1927. Another patient was operated upon for a hydated cyst of the liver on December 31, 1926. Symptoms of scarlet fever appeared on January 3, 1927.

29. Rivaroli,[25] 1927. A male patient was operated upon for an ectopic testicle on June 10 and he developed scarlet fever on June 14.

30. Rivaroli,[25] 1927. A patient had an appendectomy on July 6, 1926, and began to show signs of scarlet fever on July 8.

31. Rivaroli,[23] 1927. A young girl had her appendix removed and two days later a scarlatinal eruption appeared accompanied by fever. Desquamation occurred shortly afterward.

32. Winter,[26] 1929. This case was mentioned in an article which Winter wrote on cesarean section based upon information received by means of questionnaires. I am indebted to Professor Stoeckel whose patient this was for the history of the case. A primipara, aged twenty-six, was delivered by means of a cesarean section on February 28, 1928, because of toxemia and abruptio placentae. On March 2, there was fever and a sore throat. Cultures from the throat showed hemolytic streptococci. There was marked edema and eruption all over the body, circumoral pallor and a raspberry tongue. The wound was clean. A diagnosis of scarlet fever was made and the patient transferred to the isolation pavilion where the diagnosis was confirmed. Scarlet fever serum was given and this was followed by typical eclamptic convulsions. The rash became more pronounced and after more convulsions the patient collapsed and died. Autopsy revealed exudative peritonitis in the presence of a well-healed operative wound, fatty degeneration of the kidneys with multiple hemorrhages, fatty degeneration of the liver with hemorrhages and a soft spleen.

UNREPORTED CASES

To these 32 cases reported in the literature, some of which probably were not true cases of scarlet fever, I should like to add the following case reports. The first case is the only one I have personally encountered.

Case I. Miss P. P., No. 1,071,474, age twenty-two, was admitted to the Cook County Hospital on July 11, 1928 complaining of pain in the lower abdomen and leucorrhea which had been present for three years. The pain had begun suddenly three years before admission and had recurred periodically about every four weeks. The attacks which were severe usually lasted about seven to ten days and subsided after rest in bed and ice bags placed on the lower abdomen. During this time a profuse leucorrheal discharge was present and dysmenorrhea also was a prominent symptom. The last menstrual period had begun July 6, 1928 and, for the first time, the flow was excessive and lasted nine days.

The patient had had a number of childhood diseases but she was not certain she had had scarlet fever. Her tonsils had been removed four years before admission. The menses began at twelve years of age, recurred every twenty-five days and generally lasted three days without pain until the present illness began. The general physical examination revealed no abnormalities. There was definite tenderness in both iliac fossae and slight rigidity in both lower quadrants but no masses were felt. Vaginal examination revealed the following: There was a nulliparous outlet, a long, hard and irregular cervix and a corpus uteri of normal size, hard, anteflexed and movable. In both fornices were tender, cystic and adherent masses. The one on the left was about 7 cm. in diameter and the one on the right was much smaller. The diagnosis was pelvic inflammatory disease with a tubo-ovarian abscess on the left side.

An operation was performed on July 20 and I removed a tubo-ovarian abscess from the left side and a pyosalpinx from the right. The patient did well the day of the operation and the following day.

On the third day the temperature rose to 101°F. but the patient insisted she felt well. On the fourth day there developed a generalized, red, maculopapular eruption with an underlying erythema. The rash was most prominent on the flexor surfaces of the extremities. The tongue was red, glossy and strawberry-like. A diagnosis of scarlet fever was made and the patient was transferred to the Contagious Disease Hospital. At the latter hospital, examination showed that the maculopapular rash involved the axillae, the breasts and the flexor surfaces of the extremities with definite linear markings in the cubital regions of the arms. There was a slight eruption over the upper abdomen and back, but none on the face and neck. The tongue was strawberry and almost raspberry in appearance. The papillae were enlarged, hence the disease was in about the fourth-day stage, but the rash had the appearance of an earlier stage. There was slight congestion of the pharynx. A diagnosis of surgical scarlet fever was made. Two days after admission to the Contagious Disease Hospital the rash was fading rapidly but the tongue was still typical of scarlet fever. The skin sutures were removed July 28 and a small abscess was found in the region of the lowest stitch. Otherwise the wound had healed perfectly. On July 31, there was desquamation on the face, neck, abdomen and extremities. Following this, the convalescence was fairly good and the patient left the hospital on August 15.

Case II. (I am indebted to Dr. K. Speed for the following case report.) L. A., No. 1055-884, aged six, was admitted to the Cook County Hospital, March 27, 1928 because of a swelling in the left half of the scrotum. The past history was negative and the general examination revealed no abnormalities. In the left half of the scrotum was a swelling which was soft and the size of a walnut. The swelling was reducible and gave a distinct impulse on coughing. The point of reduction lay medial to but was separate from the internal abdominal ring. A diagnosis of left direct inguinal hernia was made and on April 4, Dr. K. Speed operated on the boy. On the third day following operation the temperature rose to 103°F. and there was much tenderness and induration around the herniotomy wound. The next day the temperature was the same, the pulse was 128 and the respirations 28 per minute. A punctate erythematous rash was noticed, involving the back of the neck, arms and chest. No Koplik spots were present and the tongue appeared normal. The throat

was negative and the wound looked clean. The white blood count was 29,200. On April 9, the temperature was 101°F., the tongue showed prominent papillae and the throat was moderately congested. The wound was infected and when opened permitted a bloody purulent discharge to escape.

The patient was transferred to the Contagious Disease Hospital with a diagnosis of scarlet fever. At the latter hospital examination showed a punctate erythema over the entire body and extremities. The face was slightly red and there was circumoral pallor. The rash disappeared on pressure. The throat was reddened but the tongue was not involved. A definite diagnosis of scarlet fever was not made until the following day. On April 17 desquamation was taking place, especially on the hands and feet. On May 4, quarantine was lifted and on May 6 the boy was transferred to the children's surgery ward where the infected wound was treated. The boy was discharged on May 25 at which time the wound had practically healed entirely.

Case III. (I am indebted to Dr. A. L. Hoyne for the following two case reports.) R. F., No. 1120560, aged eighteen, was admitted to the Cook County Hospital on June 10, 1929 because of severe pain in the right lower quadrant and vomiting. The temperature was 99.4°F., and the pulse 104 per minute. The white blood count was 18,000 and the urine negative. There was tenderness and rigidity in the right lower quadrant and a diagnosis of subacute appendicitis was made. The condition subsided and the patient was operated upon on June 22 by Dr. Johnson. The pathological diagnosis was subacute appendicitis. On the evening of the second day the temperature rose to 103°F., and the pulse was 114 per minute. The pharynx was injected. The next day the temperature was the same, the pulse rose to 140 and the pharynx remained injected. The wound was in good condition. A diagnosis of acute pharyngitis was made but the patient was isolated because there was a suspicion the condition might be scarlet fever. The patient's mother said the patient had had scarlet fever in childhood. On the evening of the third day after operation, the temperature rose to 105°F., The next day Dr. Hoyne saw the patient and made a diagnosis of scarlet fever. The patient was transferred to the Contagious Disease Hospital immediately. At this time a strawberry tongue was present. Early the following morning symptoms of collapse appeared and the patient died shortly afterwards. An autopsy was not obtained.

Case IV. L. H., a white woman eighteen years of age, was admitted to the Municipal Contagious Disease Hospital with a typical attack of scarlet fever on June 24, 1929. She had been operated upon for pyosalpinx on June 14 and developed scarlet fever six days later. On admission pus was being discharged from the abdominal incision. The patient had multiple arthritis of a mild degree as a complication of her scarlet fever. She made a complete recovery and was discharged on August 1.

In addition to these unreported cases I have received from Dr. George H. Weaver the following 4 brief case reports of scarlet fever following abdominal operation. These cases were observed at the Durand Hospital during a period of fifteen years from 1913 to 1927 and occurred among 3,979 cases of scarlet fever. During the same period there were 52 cases of surgical scarlet fever in the hospital, but only the 4 described below followed abdominal operations:

Case V. A child, No. 2623, aged five, had an operation for appendicitis on January 1, 1918. The abdominal wound suppurated and beginning January 20, typical scarlet fever developed.

Case VI. Patient No. 4241, aged nineteen had a bilateral salpingectomy performed about one month before admission on March 15, 1920. On entrance to the hospital the wound was open and suppurating. From the pus in the wound numerous hemolyzing streptococci were cultured and typical scarlet fever was present. The scarlet fever began about three weeks after the operation.

Case VII. Patient No. 6739, aged thirty-six, had her fallopian tubes removed March 14, 1923. On March 18 she had chills, fever and a sore throat. On March 21, a scarlet fever eruption appeared and the wound was slightly infected.

Case VIII. Patient No. 9321, aged six, had a herniotomy performed on April 16, 1926. On April 20 typical scarlet fever developed and

hemolyzing streptococci were cultured from the infected wound.

SUMMARY

The literature on surgical scarlet fever was reviewed and all the cases following abdominal operation were abstracted. To the 32 cases reported I have added 8 unreported cases, all of which occurred in Chicago. Many other cases have certainly been encountered, not only in Chicago but elsewhere, but they have not been reported in the literature. Surgical scarlet fever does not differ from the non-surgical type and the symptomatology and treatment are identical. It may not be amiss to emphasize that surgeons who attend cases of scarlet fever should be especially careful in their asepsis when operating. During epidemics of scarlet fever, only those operations should be performed which are absolutely imperative.

REFERENCES

1. Civiale. *Traité prat. s. l. mal. d. organes genito-urin*, iii, 3: 596, 1858. (Quoted by Hamilton.)
2. Sée. Acad. de Med., Paris, 1858. (Quoted by Hamilton.)
3. Paget, J. Clinical lecture on scarlatina after operations. *Brit. M. J.*, 2: 237, 1864. Also in his: Clinical Lectures. London, 1875, pp. 349–352.
4. Riedinger, F. Ueber das Auftreten von Scharlach bei Operierten und Verwundeten. *Centralbl. f. Chir.*, 7: 134–138, 1880.
   Scharlach nach Wunden; Erwiderung an Herrn Dr. Treub. *Ibid.*, pp. 449–452.
   Ueber die Natur des sogenannten chirurgischen Scharlachs. *Tr. Internat. M. Cong.*, 7 sess., London, 14: 180–184, 1881.
5. Marsh, H. On the nature of the so-called scarlet fever after operation. *Ibid.*, pp. 177–180.
6. Batut, L. De la scarlatine chirurgicale. Thèse de Paris, 1882.
7. Hoffa, A. Ueber den sogenannten chirurgischen Scharlach. *Samml. klin. Vortr.*, No. 292 (Chir., No. 90, 2679–2694), 1887.
8. de Bovis, R. La scarlatine traumatique. *Semaine med.*, 22: 33–39, 1902. Also transl.: *Med. Press & Circ.*, n.s., 74: 321; 350, 1902.
9. Hamilton, A. Surgical scarlatina. *Am. J. M. Sc.*, n.s., 128: 111–129, 1904.
10. Weaver, G. H. Scarlet fever. In: Abt's Pediatrics, vol. 6, Phila., Saunders, 1925.
11. Paley, W. E., and Goddhart, J. F. A contribution to the etiology of scarlatina in surgical cases. *Guy's Hosp. Rep.*, s. 3, 24: 287–317, 1879.
12. Bollici, P. Sulla scarlattina chirurgica. *Raccoglitore med.*, s. 5, 9: 89–97, 1890.
13. Salomoni, A. Due casi di scarlattina chirurgica. *Clin. chir.*, Milano, 1: 120–123, 1893.
14. McGraw, T. A. A case of surgical scarlet fever. *Phys. & Surg.*, 17: 145–150, 1895.
15. Moeller, *fils*. Scarlatines traumatiques. *Ann. de l'Inst. chir. de Brux.*, 9: 100–106, 1902.
16. Martin, Scarlatine traumatique dans une appendictomie. *Med. Inf.*, pp. 217–233, 1903. Also (abstr.), *J. de Med. de Par.*, s. 2, 15: 425, 1903.
17. Gerasimovich, V. P. Ot. naz. khirurgicheskoi skarlatinie (so-called surgical scarlatina.) *Russk. Vrach*, 2: 640; 716, 1903.
18. Nicolloti, A. Sopra un caso di scarlatina consecutiva ad operazione radicale d'ernia. *Gaz. d. osp. e d. clin.*, 25: 397–399, 1904.
19. Bernard. Scarlatine au cours des suites operatoires. *Med. inf.*, 4: 341, 1906–7. Also: *J. med. de Par.*, s. 2, 19: 114, 1907.
20. Davidovitsch, N. Ueber Scarlatina traumatica. *Jahrb. f. Kinderheil.*, 68: 143–170, 1908.
21. Roberts, J. B. The etiology of post-operative or wound scarlet fever, with report of four cases. *Tr. Am. Surg. Ass.*, 43: 451–459, 1915.
   Surgical scarlatina. *Ann. Surg.*, 64: 203, 1916.
22. Port, F. Wundscharlach. *München. med. Wchnschr.* 69: 1691–1693, 1922.
23. Günther, B. Wundscharlach. *Deutsche med. Wchnschr.*, 1: 208–209, 1924.
24. Floris, M. Case of scarlet fever following operation for necrosed, suppurating sarcoma of uterus. *Clin. ostet.*, 29: 9–20, 1927.
25. Rivaroli, R. A. Postoperative scarlet fever in infants. *Semana méd.*, 2: 1197–1200, 1927.
26. Winter, G. Die Allgemeine deutsche Kaiserschnittsstatistik von 1928. *Zentralbl. f. Gynäk.*, 53: 1874, 1929.
27. Weaver, G. H. Personal communication.

The following additional references are added for those interested in the subject of surgical scarlet fever:

Atkinson, I. E. Scarlatina and scarlatiniform eruptions following injuries and operations. *Maryland M. J.*, 15: 461–464, 1886. Also: *J. Cutan. & Ven. Dis.*, pp. 52–54, 1886. (Discusses the etiological factors in the production of scarlatiniform eruptions. No case reports.)

Beaudoin. Plaie et scarlatine. (Scarlatina following circumcision of a child of four years.) *Normandie med.*, 4: 228–230, 1889.

Bindi, F. Rara complicazione chirurgica nella scarlattina e contributo alla patogenesi della scarlattina. (Rare surgical complications in scarlatina and contributions to the pathogenesis of scarlatina.) *Gaz. d. osp. ed. clin.* 38: 755–756, 1917. (Scarlet fever in six-year-old child complicated with phlegmonous process of the left arm. General discussion of etiology of scarlet fever.)

Blasco, J. N. Un caso de escarlatina traumatica. (A case of traumatic scarlatina.) *Med. ibera*, 14: 58, 1921. (Scarlatina in a woman of thirty-three years following removal of right breast for tumor.)

Bloch, R. Surgical scarlet fever from sucking of thumb. *München. Med. Wchnschr.*, 68: 1679, 1921.

Browne, J. W. Scarlatina and simulating eruptions,

following surgical operations. *Brit. M. J.*, 2: 692–694, 1885. (Operations were for circumcision, sequestrotomy, lacerated wound of leg, hare-lip and cleft palate. No abdominal operations.)

Brunner, C. Ueber Wundscharlach. *Berl. klin. Wchnschr.*, 32: 469; 502; 548; 570; 636; 656, 1895. (None of the cases followed abdominal injury or operation.)

Cartaz, A. De la scarlatine consecutive aux operations. *Progress med.*, 6: 721, 1878. (No abdominal operations.)

Chavier and Fevrier. Deux cas de scarlatine chirurgicale. *Gaz. med. de Par.*, s. 7, 5: 414–416, 1888. (Two cases, neither of which followed abdominal operation. One was a soldier who was wounded on the arm and the other was injured on the leg by a kick from a horse.)

Clark, J. A. Surgical scarlatina. *Columbus M. J.*, 19: 294, 1897. (Case of child of eight, sustained a severe scald from shoulder to wrist.)

Colleville, G., and de Bovis, R. Pseudo-scarlatine pyogenique (scarlatine chirurgicale). *Union med. du nord-est*, 24: 309–313, 1900. (Scarlatina coexistent with retro-auricular abscess.)

Drobner, E. Przypadek tak zwanej "plonicy chirurgicznej." (Contribution to the so-called "surgical blush.") *Wiadomosci lek.*, 2: 329, 1888. (Operation on femur.)

Dufresne, E. Le scarlatine et l'état traumatique. *Art. med.*, 81: 161–182, 1895. (General article, no case reports.)

Edmunds, J. Scarlatoid disease after operation. *Brit. M. J.*, 2: 453, 1864. (Operation for enlarged glands beneath the jaw.)

Galitgkaia, E. S. Traumatic scarlatina; case. *Mosk. Med. J.*, 7: 9–10, 1927.

Hall, De H. Surgical scarlet fever. *Brit. M. J.*, 2: 964, 1884. (Case of girl of six who had undergone an operation for caries of the lower epiphysis of the left tibia.)

Hicks, J. B. Scarlatina and surgery. *Brit. M. J.*, 2: 795, 1878. (Merely a clinical memorandum.)

Hopkins, W. B. Amputation at the shoulder joint followed within forty-eight hours by an attack of scarlet fever: recovery. *Polyclin.*, Phila., 4: 182, 1886–7.

Howse, H. G. Some account of an epidemic of surgical scarlatina occurring in Astley Cooper ward in 1878; with remarks. *Guy's Hosp. Rep.* s. 3, 24: 441–462, 1879. (No abdominal operations.)

Hutinel. Les scarlatines chirurgicales. *Bull. med.*, 34: 323–327, 1920. (General article, no case reports.)

Ingerslev, F. Kirurgisk Skarlatina, indledet med en Lymphangitis brachii. (Surgical scarlatina, introduced by lymphangitis brachii.) *Hosp.-Tid.*, R. 4, 4: 573–577, 1896. Also transl.: *Ztschr. f. klin. Med.*, 31: 171–174, 1896. (Not abdominal scarlet fever.)

Jones, T. B., and Kohn, L. A. Case of surgical scarlet fever. *Arch. Surg.*, 16: (pt. 1) 139–143, 1928. (Case report of a boy aged fifteen. Scarlet fever in wound in leg.)

Jurinac, L. Traumatic or surgical scarlet fever. *Med. Klin.*, 21: 1307–1308, 1925. (No abdominal wounds.)

Kelly, A. L. Notes of a few cases of so-called traumatic scarlet fever. *Glasgow M. J.*, s. 4, 25: 386–391, 1886. (Cases of children injured by falls and blows; scarlet fever followed injury.)

Klix. Ein Fall von Scharlach nach Trauma. *Aerztl. Sachverst. Ztg.*, 9: 460, 1903. (Not operative scarlet fever.)

Koch, E. Ein Beitrag zur Kentniss des chirurgischen Scharlach aus dem Kinder-Spital zu Basel. (Basel). Luzern, 1892. (None of the wounds abdominal.)

Konetschke. Ueber den Wesen des sogenannten chirurgischen Scharlachs. *Wien. med. Presse*, 23: 1483–1485, 1882. (Author quotes Gussenbauer on surgical scarlet fever, and then cites the case of a boy of nine, where a scarlet fever rash appeared during recovery from a leg fracture.)

Korach, S. Traumatic scarlet fever. *Deutsche med. Wchnschr.*, 43: 12, 1917. (Wounds not abdominal).

Kredel, L. Ueber Wundscharlach. *Arch. f. klin. Chir.*, 87: 931–943, 1908. (Not stated whether wounds were abdominal or otherwise).

Krolikowski, W. Scarlatina chirurgica, s. traumatica, s. extrabuccalis. *Przegl. pedyat.*, 1: 321–336, 1908–09. (Twenty-one cases with operations for genu valgus, coxitis, otitis media, phlegmone of the popliteal space, etc., but no cases of abdominal operation.)

Kronenberg, H. G. Scarlatina chirurgicalis. Leyden, 1880. (Only one abdominal case mentioned; see Paley and Goddhart's case from *Guy's Hosp. Rep.*)

Larkham, E. T. Case of surgical scarlet fever. *Brit. M. J.*, 1: 340, 1901. (Boy of seventeen had an abscess on dorsum of foot which was opened.)

Lebedeva, N. I. Surgical or traumatic scarlatina. *Mosk. Med. J.*, 7: No. 4, 11–17, 1927.

Le Grand, J. Scarlatina chirurgicale par septicemie; traitement par autohemotherapie. *Normandie med.*, 34: 89–91, 1923. (Scarlatina eruption over entire body following operation for furuncles on back.)

Lippmann, T. Ein Fall von traumatischem Scharlach. *Wien. klin. Rundschau*, 16: 257; 279; 356, 1902. Also (Abstr.): *Deutsche med. Wchnschr.*, 27: Ver.-Beil., 234, 1901. (Injury not abdominal.)

Lloyd, J. H. Surgical scarlatina. *Ann. Gynaec. & Pediat.*, 4: 434–438, 1890–1891. Also: *Proc. Phila. Co. M. Soc.*, 12: 132–139, 1891. (Case of scarlet fever folllowing trephining operation.)

Lucy. Un cas de scarlatine traumatique. *Centre med. et pharm.*, 8: 102, 1902–3. (No operation. Child had been bitten by a playmate.)

Mathe, G. A scarlatina chirurgicarol. *Gyogyaszat*, 46: 84–89, 1906. Also transl.: *Ungar. med. Presse*, 11: 75–77, 1906.

Mengoni, E., and Zannoni, T. Un caso di scarlattina chirurgica. *Riv. di clin. pediat.*, 6: 920–923, 1908.

Meyer, L. Om skarlagensfeber hos barselkvinder. *Gynak. og. Meddelelser*, 244, 1886–1887.

Moore, G. R. Scarlatina following injuries. *Brit. M. J.*, 2: 859, 1878. (Cases of children injured by falls and burns followed by scarlet fever.)

Murray, R. W. Remarks on an outbreak of scarlet fever in a surgical ward. *Brit. M. J.* 1: 1328, 1887. (Cases of scarlet fever in children following various operations, but none abdominal).

Navarro, B. J. Un caso de escarlatina traumatica. *Med. ibera*, 14: 58, 1921. (Not abdominal.)

Otto. Case of wound scarlet fever. *München. med. Wchnschr.*, 70: 301, 1923. (Not abdominal wound.)

Owen, E. Scarlet fever following operation. *Louisville M. News*, 9: 235–230, 1880. (Author reports 2 cases of scarlet fever following operations: (1) Case of boy three years old who underwent operation for a cleft which implicated the hard and soft palate. (2) Case of a girl aged seventeen months. Tracheotomy performed for the removal of a fish bone.)

Page, H. W. A note and a question on so-called surgical scarlet fever. *Lancet*, 1: 887, 1885. (No abdominal operations.)

Papp, G. Sebezi vorheny. (Surgical scarlatina.) *Gyogyaszat*, 47: 515, 1907.

Parker, R. W. Surgical scarlet fever. *Brit. M. J.*, 2: 964, 1884. (Author states that scarlet fever frequently follows operations in children. Nothing more given.)

Parish, J. K. Surgical scarlet fever. Case report. *Surg. J.* 33: 125, 1927. (Breast abscess.)

Patin, A. Ueber Scharlach bei Verwundeten. Wurzburg, 1884. (Three cases given but none of them involved abdominal wound.)

Peake, A. W. Surgical scarlatina following an operation for gonorrheal buboes. *Brit. M. J.*, 1: 923, 1895.

Perlis, I. O plonicy przyransej. (Scarlatina traumatica, chirurgica.) *Czasopismo lek.*, 2: 89–94, 1900. (Two cases: (1) Hand and arm. (2) Knee after bruise from fall on pavement.)

Pösch, W. Ueber Scharlach im Wochenbett. *Ztschr. f. Geburtsh. u. Gynäk.*, 90: 609–630, 1927. (Not abdominal scarlet fever.)

Reiss, E., and Weihe, F. Kasuistischer Beitrag zur Aetiologie des Scharlach und zur Frage der Wundscharlach. *Jahrb. f. Kinderh.*, 82: 422–426, 1915. (Not abdominal injury.)

Remlinger, R. Un cas de scarlatine traumatique. *Caducee*, 2: 214, 1902. Also: *Gaz. med. d'Orient.* pp. 84–87, 1902. (A soldier fell on his right shoulder without breaking any bones. Within twenty-four hours, scarlatina rash appeared all over his body, except his face.)

Ricklin, E. Traumatisme et scarlatine. *Gaz. med. de Par.*, s. 3, 2: 461, 1880.

Riedinger, F. Auftreten einer Scarlatina in der Nahe der Wunde beginnend, Tags nach der Exstirpation eines Lipoms. *Med.-Chir. Centralbl. Wien*, 15: 112, 1880.

Roberts, J. B. The etiology of post-operative or wound scarlet fever. *Med. Council*, 21: 33–36, 1916.

A further note on etiology of surgical scarlatina. *Tr. Am. Surg. Ass.*, 34: 161–164, 1916.

Sarytchev. *Chir. Lietopiss*, 2: pt. 2, p. 225, 1892.

Spannocchi, T. Risposta alla nota del dott. Bollici sulla scarlattina chirurgica. *Raccoglitore med.*, s. 5, 9: 162–165, 1890.

Strubell, A. Ueber sogenennten Wundscharlach. *Mitt. a.d. Grenzgeb. d. Med. u. Chir.*, 4: 15029, 1898. (Reports 1 case, not abdominal.)

Trellat, U. Scarlatine consecutive aux operation; son influence sur les plaies. *Progres med.*, 6: 721, 1878. Also: *Gaz. d. hop.*, 51: 977, 1878. Also transl.: *London M. Rec.*, 6: 417–419, 1878. Also transl.: *Anfiteatro anat.*, 7: 182, 1879. (Same case as in Cartaz article.)

Treub, H. Scharlachepidemie in einer chirurgischen Krankenabtheilung. *Centralbl. f. Chir.*, 7: 289–292, 1880. (See also *supra*, Riedinger, F.) (No abdominal cases.)

Vander Bogert, F. Scarlet fever from a wound in the foot. *Arch. Pediat.*, 26: 126, 1909. (Case of boy of five in which the virus entered the body at point of injury (foot). Proved by the pure culture of streptococci obtained from the wound and by the enlargement of the inguinal glands.)

Voinoff, B. N. (So-called "wound scarlatina" and scarlatiniform erythemata.) *Russk. Vrach.*, 11: 623; 654, 1912. (No mention of scarlatina after abdominal operation.)

Volkovitch, N. M. Contribution a l'etude de la scarlatine dite chirurgicale (en russe). *Vratch*, March, 7 and 14, 1891.

Washbourn, J. W. A note on scarlet fever arising after operations on the throat. *Clin. J.*, 20: 405, 1902.

Werner. Ein chirurgischer Scharlach. *Memorabilien, Heilbr.*, n. F., 13: 459–463, 1894. (Not abdominal scarlet fever.)

IMMEDIATE CAUSES OF DEATH FOLLOWING OPERATIONS ON GALL BLADDER & DUCTS*

E. MacD. Stanton, M.D. F.A.C.S.

SCHENECTADY, N. Y.

THE study which forms the basis of this thesis was first suggested to the writer when at a staff surgical conference which he attended the question was asked, "What are the chief causes of death following gall bladder operations?" From the discussion which followed it was quite evident that among the several surgeons present no one had any really satisfactory knowledge of the subject. A subsequent review of the literature revealed the fact that notwithstanding the rather abundant literature dealing with the mortality rates associated with gall bladder surgery, there is a decided paucity of systematized data concerning the relative frequency of the various causes immediately responsible for the mortality following operations on the biliary tract. In order to get the desired information on this subject, the writer has collected from the literature the causes of death as given in 400 fatal cases. Also, in addition to the above, and for the purpose of more detailed comparative studies, he has reviewed the hospital charts and other available data pertaining to 100 postoperative gall bladder deaths collected from his own case histories, from the records of the Ellis Hospital and from the records of fatal cases furnished by a number of his surgeon friends.

Table 1 gives a summary of the causes of death as collected from the literature and from the personally studied case histories, the combined figures comprising a total of 500 fatal cases.

The term, cause of death, to a large extent represents a clinical opinion and even with most detailed data including autopsy findings opinions may differ in the individual case as to the actual cause of death. Nevertheless, when a fairly large series of cases is studied, it is found that a considerable proportion of the

Table 1

SUMMARY OF DEATHS COLLECTED FROM LITERATURE AND FROM HOSPITAL RECORDS

	Lit.	Hosp. Records	Total
Operative shock	25	..	25
Operative hemorrhage	23	9	32
Pulmonary embolus	31	2	33
Fat embolism	1	2	3
High temperature rapid deaths	5	15	20
Acute gastric dilatation; pyloric obstruction	3	..	3
Intestinal obstruction	6	..	6
Protracted vomiting	1	4	5
Rupture of incision	1	..	1
Anaesthetic death $N_2O_2 + O_2$	..	1	1
Duodenal perforation; operative trauma	..	1	1
Serum anaphylaxis	..	1	1
Erysipelas abdominal wound	1	..	1
Peritonitis; bile not mentioned	73	4	77
Spontaneous perforation gall bladder or ducts; bile peritonitis	24	8	32
Subdiaphragmatic abscess	6	1	7
Cholemia; no hemorrhage	13	9	22
Cholemia; postoperative hemorrhage	10	10	20
Hepatic insufficiency	19	..	19
Cholangitis and liver abscess	19	..	19
Overlooked duct stones	2	..	2
Sepsis (pyemic processes)	16	..	16
Acute pancreatitis	5	2	7
Cirrhosis of liver	3	2	5
Acute infection; fulminating acute cases	2	..	2
Pancreatic asthenia	..	1	1
Exhaustion	4	..	4
Pneumonia and pulmonary deaths	47	6	53
Cardiac failure; myocardial conditions	30	4	34
Renal failure	18	6	24
Diabetic coma	1	..	1
Thyroid intoxication	1	..	1
Thrombosis iliacs and vena cava	1	..	1
Complications of other operations	1	3	4
Cerebral hemorrhage	1	1	2
Acute hepatitis; alcoholism	..	1	1
Delirium tremens; mental conditions	..	2	2
Undetermined	7	5	12

* Presented before The American Association of Obstetricians, Gynecologists and Abdominal Surgeons, Memphis, Tenn., Sept. 1929.

individual cases falls into sharply defined groups which can be determined with far more certainty than the detached individual case. I believe that the series here reported does give a reasonably accurate picture of the causes of death encountered by a number of surgeons in the course of approximately 10,000 gall bladder operations.

The hazards of gall bladder surgery naturally fall into several more or less sharply defined categories, as for instance, the dangers incident to the operation itself, the dangers due primarily to the disease process itself and the dangers more or less associated with the age and general condition of the patients who suffer from gall bladder disease.

Operative shock and hemorrhage account for a total of 57 deaths, or 11 per cent of all of the operative fatalities. From the literature data, it would seem that operative shock and hemorrhage are about equally responsible, there being 25 cases classed as shock and 23 as hemorrhage. However, most of the 9 cases from the personally studied charts now listed under hemorrhage were charted as deaths due to shock. In studying the operation reports and charts of these 9 cases, it is perfectly clear that hemorrhage was the primary cause for nearly all of these immediate operative disasters. A clamp or ligature slipped, or a vessel was torn, and then the trouble began. These operative hemorrhage deaths represent 9 per cent of the total mortality of my series and the shock and hemorrhage cases account for 11 per cent of the deaths collected from the literature and yet, they represent only a fraction of 1 per cent of the total cases operated. The problem of the control of hemorrhage during operation is a purely technical one. Careful, accurate technic with the application of sound judgment in the presence of difficulties can certainly reduce the incidence of hemorrhage and shock to a point where it does not represent anything like 1/10 of the total hazard of gall bladder operations.

Pulmonary embolus accounts for 33 deaths, or 6.6 per cent of the total. In the writer's series only 2 per cent of the deaths were ascribed to pulmonary embolism, whereas in the group collected from the literature nearly 8 per cent are listed as due to this cause. When going over the literature, I was inclined to feel that some of the surgeons reporting cases were perhaps partial to pulmonary embolus as a cause of death. It seems probable that the 6.6 per cent as represented by the combined figures may represent approximately the truth. Wilson[1] records only 9 deaths from pulmonary embolism in 4597 operations on the ball bladder.

Only 3 deaths are listed as due to fat embolism. The writer is, however, inclined to believe that fat embolism may have been a contributing cause of some of the deaths listed under other causes.

Along with the other causes of death associated directly with the operation itself, 20 deaths are listed under the term, "high temperature rapid deaths." In the writer's series collected directly from the clinical records, this is the most frequent terminal picture encountered. In this series, it is represented by a rather sharply defined group of 15 cases which can be assigned to no other cause or causes. It seems probable that at least 3 or 4 other deaths occurring in this personally studied series could properly be placed in this group but, because in the recorded histories other causes have been definitely assigned by the attending surgeons, they have not been listed as high temperature rapid deaths.

The charts of the 15 cases included in this group present a striking and, I believe, a sharply defined picture. They are characterized chiefly by a rapid, steady rise in temperature. Before death, temperature readings of 105° to 106° or even higher are not uncommon. The temperature rise usually begins within six to twelve hours after the operation. With the temperature once started on its upward trend, there

[1] Wilson. Fatal postoperative embolism. *Ann. Surg.*, 56:811, 1912.

are seldom any remissions and death usually ensues within thirty-six to forty-eight hours. Along with the rapid and extreme rise in temperature these patients present a greatly accelerated, weak pulse, extreme nervousness and, toward the last, rapid shallow respirations. Charts Nos. I to VI show the character of the temperature, pulse and respiration curves encountered in these cases. One other point of interest in connection with these cases is the fact that in not one of the 15 deaths had the surgeon in attendance ventured an opinion as to the cause of death.

The writer knows of no other terminal picture occurring in surgical cases which very closely simulates these high temperature rapid deaths. While individual cases occurring once or twice in several years' work might escape notice, the combined group stands out in a manner which suggests that this type of death may be as closely associated with biliary surgery as is postoperative hyperthyroidism with goiter surgery.

During the past few months, I have discussed the problem of these cases with possibly 25 surgeons, every one of whom can remember similar tragedies in his own practice. No one of them, however, has had any satisfactory explanation to offer as to the cause. Among those who have given special study to gall bladder surgery or who have done experimental work on the gall bladder and liver, no two have agreed on the possible explanations they have suggested. One says, "we believe these particular patients died from absorption of either diseased or chemically altered liver cells or toxic bile." Another experimental investigator suggests that altered cholesterin metabolism may be responsible while still another suggests that injury to the nervous mechanism of the liver may be responsible for these fatalities.

In the literature I have been able to find only one undoubted reference to this type of death. Cave[2] in 1926 in reporting 35 postoperative gall bladder deaths from the Second Surgical Division, Roosevelt Hospital, under the head of "Immediate Operative Mortality of Unknown Origin" reports 3 of these cases as follows:

There were three cases that died within forty hours with immediate hyperpyrexia one 107.2 degrees, another 106 degrees and the other 107 degrees; hemorrhage, peritonitis, pneumonia, embolism were all ruled out clinically; in all cholecystectomy was the procedure. These were not the acutely inflamed type but simply cases with symptoms of prolonged chronic cholecystitis with calculi in the gall bladder in otherwise healthy women, not jaundiced. In one, a cholecystostomy had been done one year previously. According to the operative notes the procedures were carried through without difficulty, in fact, two noted as being extremely easy. All three were drained, one through the upper angle of the wound, the other through lateral stab wounds with tight closure of the anterior abdominal wound. It seemed that immediately the operation was finished, the temperature began to rise and reached exceedingly high levels with an accompanying rapid pulse rate. Although no mention is made of unusual liver traumatization except in one instance, we believe these particular cases died from absorption of either diseased or chemically altered liver cells or toxic bile. The appearance or consistency of the liver was not noted.

It is a startling and helpless situation to follow to its quick termination one of these catastrophies—the last one of these three here reported occurred in a young healthy vigorous Greek woman of thirty-five with a definite and classical history of diseased gall bladder for a period of over three years without jaundice; heart, lungs, kidneys normal; cholecystography revealed numerous shadows indicative of stones in a slightly enlarged gall bladder. Operation upper right rectus incision and easy and splendid exposure of gall bladder and ducts; the cystic artery and duct fully exposed; comfortably handled and twice transfixed with chronic catgut before being cut across and the third ligation of the duct and artery made by transfixion and tying after removal of the clamp and the gray-walled, stone-filled gall bladder; the excision being easily carried out from below upward. The liver bed from which it was removed was rather broad, however, with only

[2] Cave, H. W. Dangers incident to cholecystectomy. *Ann. Surg.*, 84: 371–378, 1926.

moderate oozing; the sulcus sutured over with the stump of the cystic artery and duct securely tucked and sutured into it at its lowermost angle, so dry was the area that it was remarked to be an ideal case for closure without drainage, however, a lateral stab wound to flank, wrapped tube drain to Morrison's pouch and a tight closure of the anterior abdominal wound was done. Immediate precipitous rise of temperature to 106 degrees at the termination which took place in forty hours. Pulse rate rose steadily with temperature curve to 154, no signs of pneumonia clinically or from portable x-ray films, a dressing done the drain loosened and withdrawn a short distance, a slight amount of bile-stained secretion on the dressing. No evidence whatever of hemorrhage.

I have also found two other individual cases reported in the literature. The typical clinical picture is described in each instance without to diagnose the cause of death.

The clinical picture is almost certainly that of an overwhelming toxemia. Because in one of my early cases I found at autopsy a definite acute cholangitis extensively involving the intrahepatic bile ducts, and because within the scope of my observations several of these deaths had occurred following operations performed during or just following acute attacks, I had until quite recently felt reasonably certain that these deaths were due to acute cholangitis. The very direct relationship of the onset of the hyperpyrexia to the operation, I had postulated as being in some way due to the lighting up of an infection as a result of operative manipulations or interference with liver functions. More recently a number of facts have been observed which do not square with the cholangitis hypothesis. In the first place, microscopical examination of the liver as found at autopsy does not always show the expected degree of cholangitis. Also, I have among my charts a recent case of a young man, age twenty-three, who died forty-seven hours after a traumatic rupture of his liver. Hemorrhage from a 2 in. rent in the dome of his liver was the predominating intra-abdominal finding, both at operation six hours after the injury and at autopsy. Most certainly this young man did not have a cholangitis. Had the same amount of intra-abdominal hemorrhage been the result of an ectopic pregnancy or a ruptured spleen, the clinical picture would have been that of the shock due to the hemorrhage, namely, a rapid pulse with a subnormal or but slightly elevated temperature. In this case of ruptured liver, the temperature began to rise soon after admission and reached 105. 6° twenty-two hours after the accident. The clinical picture presented by this traumatic liver death is so strikingly similar to that seen in the high temperature, rapid deaths following gall bladder operations that I am led to suspect very strongly that similar factors are operative in each instance.

What these factors are I am unable to state at the present time. In many respects the high temperature, rapid pulse clinical picture is not totally unlike postoperative hyperthyroidism. Crile has shown a close interrelationship between the thyroid, the adrenals and the liver. The complex relations of the liver to states of shock and to basal metabolism have been studied by many investigators. Nowhere in the literature that I have so far studied, have I come across any data tending to throw much light on the problem presented by the 15 high temperature, rapid deaths found in this series.

It is possible that the blood chemistry observable during the period between operation and death might throw some light on the nature of the condition. We intend making these studies the first time we are unfortunate enough to encounter one of these cases again. The ideal way would be for surgeons interested in the problem to report their findings to a central clearing house for correlation and analysis.

In the series collected from the literature, 3 deaths are listed as due to acute gastric dilatation or pyloric obstruction and 6 deaths as due to intestinal obstruction.

A total of 5 deaths are listed as due to protracted vomiting. Four of these cases

occurred in the series studied by the writer. These 4 deaths presented no other particularly noteworthy features in the terminal picture. The vomiting was of the frequent gulping type not uncommonly encountered after gall bladder operations. Persistent vomiting of this type has long been recognized as one of the common and occasionally dangerous complications following gall bladder operations. In some cases gastric lavage has seemed to give marked relief and if so the condition may be accounted for as being the nature of a temporary pyloric obstruction. Other cases are apparently not influenced by lavage or other therapeutic means. The writer has never been able to account satisfactorily for these cases. It is quite possible, however, that the experimental work of Horrall and others may throw some light on this subject. When bile is injected into the peritoneal cavity of a dog or when it is allowed to flow into the peritoneum through an opening in the gall bladder, persistent vomiting is one of the most constant symptoms of the bile poisoning. In the light of this experimental data, it seems quite possible that absorption of bile either from the free peritoneum or from surfaces in contact with bile-soaked drainage gauze may be the cause of this type of vomiting. When the writer read the reports of Horrall's experiments he resolved that in the future he would be much more careful not only as regards spilling of bile at the time of operation but also as regards the use of drains which might become bile-soaked and serve as reservoirs from which the bile could be absorbed. This whole subject warrants careful clinical study to examine the facts from the viewpoints suggested by the experimental findings.

Among the less common causes of death directly associated with the operation itself, rupture of the incision, anesthesia $N_2O_2 + O_2$, operative injury of the duodenum, serum anaphylaxis following prophylactic injection of rabbit serum to control bleeding and erysipelas of the abdominal wound account for one death each.

The cases of erysipelas of the abdominal wound is the only instance in the entire series studied in which a surgical infection of the accidental type is given as a cause of death.

In the combined series, peritonitis is credited as the cause of 109 deaths. Thirty-two of these deaths were definitely due to bile peritonitis leaving 77 deaths or 15.4 per cent of the total listed simply as peritonitis. In the writer's series only 4 per cent of the deaths are ascribed to peritonitis other than bile peritonitis while in the cases collected from the literature over 18 per cent of the fatalities are listed simply as due to peritonitis. It seems probable that a considerable proportion of the 73 deaths recorded in the literature as due to peritonitis was due primarily to leakage of bile rather than to intraperitoneal infection. It is only within the last few years that the importance of bile peritonitis distinct from peritonitis of purely infectious origin has been recognized. The peritonitis cases reported in the literature were to a considerable extent grouped in relation to certain types of operative conditions. First, peritonitis as might be expected is frequently associated with operations performed during the acute stage in the severe, fulminating types of cases. Also, it is a frequent cause of death after the more difficult common duct operations and particularly after secondary operations on the ducts. Peritonitis is apparently the chief cause of the deaths occurring in cases in which fistulae between the gall bladder and stomach or intestines are found at operation. Several of the peritonitis deaths followed accidental operative injury of some portion of the intestinal tract.

Thirty-two deaths in the combined series occurred in the presence of spontaneous perforation of the gall bladder or ducts. This condition is considered a relatively rate complication of gall bladder disease but when it does occur it is associ-

ated with a very high operative mortality. In the writer's series, it was responsible for 8 per cent of the total mortality. Gosset, Desplas and Bonnet[3] reviewed 111 cases, mostly spontaneous perforation of the gall bladder into the peritoneal cavity in which operation was performed. The mortality was 52.2 per cent. They concluded that frank perforation of the gall bladder is much more serious than perforation of gastric or duodenal ulcer. Meissner[4] reported 12 cases of rupture of the common duct with 8 deaths and 7 cases of rupture of the hepatic ducts with 5 deaths. Reports from other sources simply confirm the data already quoted.

For a long time it was assumed that the bile itself was relatively harmless and that the lethal symptoms were due to bacterial infection present in the bile. As long ago as 1909 Sellands[5] showed that 15 c.c. of auto- or hetero-bile injected intraperitoneally into rabbits weighing 1000 gr. caused death in a few hours.

O. H. Horrall has recently reviewed this subject and has added a considerable amount of experimental data and his work has, I believe enabled the clinician to form a clear-cut and accurate concept of the situation. His results may be summarized as follows:

Bile in the peritoneal cavity acts as a true chemical poison. In dogs 5 c.c. or more per k. of body weight causes death within twenty-four hours. Sterilized bile has the same effect as unsterilized bile. Sublethal doses produce toxic effects commensurate with the quantity of bile entering the peritoneal cavity. As regards the treatment of bile peritonitis in the dog, Horrall says:

> In a number of dogs the gall bladder was opened and left open as in the early operations, and after varying intervals of time the abdomen was aseptically reopened and the gall bladder closed. Various intervals of time were set for the closing of the gall bladder, all of which must be within twenty-four hours. At the time the gall bladder was closed, the peritoneal cavity was thoroughly washed out with sodium chloride solution and a quantity of the solution was left in the peritoneal cavity. The dogs in which the second operation was done at eighteen hours all died; one lived at sixteen hours; all lived at twelve hours or less. Apparently, then, the maximum time at which the operation can be done following rupture of the gall bladder is sixteen hours; the preferable time is twelve hours or less.

Seven deaths are listed as due to subdiaphragmatic abscess. This condition is very rarely recognized clinically. On the other hand, it appears to be rather frequently found at autopsy. I believe that it is a more frequent complication of gall bladder operations than the figures would indicate. Its frequency can probably be reduced by careful operative technic and efficient drainage.

One hundred and forty-nine deaths or 30 per cent of the total are listed under causes directly associated with the biliary pathology encountered at operation. The deaths due to perforation of the gall bladder or ducts have already been discussed and are included in the 149 cases. It is impossible to state how many of the other peritonitis deaths were really associated with the disease itself rather than with the operative interference. With these added, it is safe to say that something over one-third of the deaths recorded in the combined series can be traced to the results of the disease itself.

The greatly increased operative risk in the presence of jaundice has always been recognized. In the combined series, 42 deaths are listed as due to cholemia with or without postoperative hemorrhage and 19 as due to hepatic insufficiency following for the most part operations performed in the presence of duct obstruction. Twenty, or approximately half of the deaths listed under cholemia were due to postoperative hemorrhage of the uncontrollable oozing type characteristic of

[3] Gosset, Desplas and Bonnet. *J. de chir.*, 25: 257, 1925.

[4] Meissner. *Beitr. z. klin. chir.*, 54: 204, 1907.

[5] Sellands, A. W. *J. Exper. Med.*, 11: 786, 1909.

this condition. Since the introduction by Walters of the $CaCl_2$ method of controlling hemorrhage in the presence of jaundice, we have at our command a means by which a very considerable proportion of the deaths from hemorrhage associated with cholemia can be prevented.

Nineteen deaths are ascribed to cholangitis or liver abscess apparently secondary to cholangitis. It seems probable that cholangitis was an important contributing cause of death in a number of cases listed under other headings.

Common duct stones overlooked at the time of operation were given as the cause of death in 2 cases.

Pyemic processes such as multiple lung abscesses, splenic abscesses and secondary abscesses in other parts of the body account for 16 deaths. This represents only approximately 3 per cent of the total deaths and in some of the cases here included the relation of the pyemic infection to the gall bladder pathology or the operation is rather doubtful. The low incidence of infection per se as a cause of death following gall bladder operations would seem to indicate that infection plays a secondary, rather than a dominant, rôle in the pathological processes associated with this field of surgery.

Acute pancreatitis is listed as the cause of death in 7 cases. The association of acute pancreatitis with gall bladder conditions has long been fully recognized.

Cirrhosis of the liver is given as the cause of 5 deaths, acute infection in fulminating cases 2 deaths, pancreatic asthenia 1 death and exhaustion 4 deaths.

Pneumonia and acute pulmonary complications account for 53 deaths. In the writer's series, pulmonary complications accounted for 6 per cent of the deaths, whereas in the literature pneumonia is given as the cause of death in approximately 12 per cent of the cases. Unquestionably pneumonia is one of the most important of the dangerous complications of gall bladder surgery. Its high incidence in this field of surgery is probably dependent upon a number of factors, such as the relatively advanced age of a large proportion of the patients, the high incidence of obesity and the fact that following the operation free movement of the diaphragm is often painful. It is the writer's opinion, however, that the pneumonia as listed in the cases collected from the literature was often a purely terminal event rather than a primary determining cause of death. As already stated, I would be inclined to transfer to the high temperature rapid death group, 2 of the 6 cases in my series listed as pneumonia. If the high temperature rapid death syndrome proves to be a true clinical entity, it seems probable that in the future a good many cases now listed as terminal pneumonia with the diagnosis based largely on a high terminal respiratory rate will be classified as high temperature rapid deaths.

Cardiac and myocardial conditions are given as the cause of death in 34 cases. Considering the age, obesity and general condition of many of the patients, this appears to be a low incidence for this type of death.

Renal failure, chiefly anuria, is given as the cause of death in 24 cases.

Diabetic coma is mentioned as the cause of only 1 death. Considering the frequency of diabetes during the age periods which furnish most of our gall bladder patients and the supposed relationship between chronic pancreatitis and cholecystitis, the extreme rarity of diabetic coma in association with gall bladder surgery is, I believe, worthy of emphasis.

Among the other miscellaneous deaths associated with conditions not directly related with the gall bladder, there was 1 death from thyroid intoxication, 1 death from thrombosis of the iliacs and vena cava, 4 deaths from complications of other operations, 2 deaths from cerebral hemorrhage, 1 death from acute hepatitis associated with alcoholism and 2 deaths from acute mental conditions.

Twelve deaths were listed as due to undetermined causes.

RIGHT-SIDED TRAUMATIC HERNIA OF THE DIAPHRAGM

OBSERVATIONS ON A CASE*

FRANK N. DEALY, M.D., F.A.C.S.

NEW YORK

IN the mass of surgical conditions commonly met, diaphragmatic hernia in itself is still so sufficiently infrequent as to arrest attention. At the Mayo Clinic it is said to occur once in 23,000 cases, and as in a series of 276 cases collected by Lacher it was found to occur on the right side in only 15 per cent of the total, the assumption that a right-sided hernia is sufficiently unusual to merit reporting may be justified.

The fact that most diaphragmatic hernias are left-sided is due partly to the protection on the right side afforded by the bulk of the liver. Occupying as it does the right dome of the diaphragm, the liver serves as a barrier at this site to the passage of abdominal contents into the right pleural cavity. The structure of the diaphragm itself however, is also of importance in favoring the preponderance of left-sided hernias. Arising from fleshy muscular slips from the ribs and sternum on the sides and anteriorly, the crura and arcuate ligaments posteriorly, it is inserted into a trilobed central tendon. This tendon occupies proportionately more of the right and anterior aspects of the diaphragm than it does of the left vault. Muscle fibers which can be separated or split offer less resistance to the passage of a hernia than tendon, and as the left lobe of the central tendon is the smallest of the three, there is proportionately more opportunity for a hernia to develop on the left side than anywhere else.

Hernias tend to protrude through the diaphragm at the site of normal apertures, such as the foramina of Morgagni at the junction of the sternum and the seventh costal cartilage on each side, and the foramina of Bochdolek, posteriorly, between the lumbar and costal divisions of the diaphragm. Their most common site however, is through the esophageal opening. This aperture, slightly to the left of the midline and one of the three large normal openings of the diaphragm, is elliptical in outline and is the only one of the three that is muscular in structure, thus lending itself to dilatation from increased abdominal pressure beneath. The opening for the vena cava at the right is protected by the liver and is tendinous in structure while that for the aorta besides being of a tendinous nature, formed by the decussation of the crura, is really behind rather than in the diaphragm. These considerations probably account for the fact that while diaphragmatic hernias through the esophageal opening are the usual type, none has ever been reported as occurring through the opening for the aorta or the vena cava, and that while hernias in general usually enter the left chest and often force their way into the posterior mediastinum, they are rarely seen occupying the right pleural cavity.

Diaphragmatic hernia usually is divided into the following types: congenital, acquired and traumatic, a differentiation which is important not only from the standpoint of the suitability for surgical treatment, but in these days of compensation awards, from the standpoint also of the part that industrial accidents may play in their production. In the congenital type, and in such cases there may be congenital defects elsewhere, there is imperfect development, with lack of fusion of component parts of the diaphragm, with resulting open defects through which abdominal organs make their way into the thorax. Such hernias have no sac. In the acquired type, the hernial mass, covered

*Submitted for publication January 28, 1930.

by peritoneum and parietal pleura, forces its way between the muscle fibers of the diaphragm at a weak spot, usually at the site of a normal opening, until it comes to occupy a thoracic position while the traumatic cases arise from injury of the diaphragm, the result of stab or gunshot wounds, fractures of ribs, falls or crushing injuries of the thorax or abdomen. Traumatic hernias are usually at the periphery, whereas the other types are commonly centrally located.

In a succinct analysis of 378 cases in which operation was performed, 19 of which were at the Mayo Clinic, Hedblom found even on excluding the war cases, that most diaphragmatic hernias are traumatic in origin. His figures are as follows:

	Per cent
Traumatic	60.1
Congenital	14.7
Acquired	14.8
Indeterminate	10.3

Thus, as he states, of reported civilian patients operated upon, two-thirds of the cases are traumatic, one-sixth congenital and one-sixth acquired. In a considerable number of the traumatic cases however, there is a latent period between the injury and the onset of symptoms, and in a large proportion, months or years may elapse before operation.

In eventration of the diaphragm, which is not a true hernia at all, owing to extreme atrophy, with fatty degeneration of the muscular fibers, the diaphragm like a thin membrane yields to the pressure of the stomach and intestines below it, and together with them is displaced into the thorax. This condition may be the result of insufficient muscular development, may be due to trauma, may result from injury to the left phrenic nerve or be a part of a poliomyelitis. Surgical treatment is obviously futile and the difficulties of a correct diagnosis apparent.

One peculiar type of diaphragmatic hernia, the so-called paraesophageal type, of which up to 1924 only 6 cases had been reported in the literature, is probably the result of a congenitally short esophagus. One such case at autopsy showed the esophagus to be 19.5 cm. in length from the cricoid cartilage (normal average length 23–25 cm.), with the fundus of the stomach herniated through the esophageal opening, lying in the right chest, the greater curvature to the right, the lesser to the left and the pylorus extending back into the abdomen through the hernial opening. Moreover, 3 cm. above the hernial opening was a perforation of a gastric ulcer! This type of hernia is mentioned here only because of the futility of surgery in such a case, as due to the shortness of the esophagus reduction of the hernia is impossible. It seems proper therefore to determine preoperatively by *x*-ray the length of the esophagus in cases of diaphragmatic hernia as a guide to the possibility of surgical relief.

The symptoms of a diaphragmatic hernia of any type fall into two main classes, abdominal and thoracic, for there is not only an impairment of function of the abdominal viscus imprisoned in the hernial mass, but an interference as well in the free action of adjacent organs both thoracic and abdominal. The urgency of symptoms does not depend so much upon the size of the hernia, as upon the degree to which it has become adherent, its effect upon the esophagus blocking it or causing an incompetency of the cardioesophageal opening or its obstructive effect upon the stomach or bowel.

Substernal pain, vague gastric distress, vomiting and constipation are the commonest symptoms referable to the gastrointestinal tract. These symptoms may come on only at night, when the patient is lying down, or there may be morning vomiting or acid regurgitation due to incompetency of the cardioesophageal opening. Dyspepsia or indigestion may occur and give rise to a tentative diagnosis of ulcer or gall bladder disease. There may be attacks of recurring intestinal obstruction or there may of course be evidences of strangulation.

Among the thoracic symptoms cough and cyanosis are probably the most common. Dyspnea is not so frequent, but may occur along with pain, palpitation, hiccup and other symptoms of thoracic intrusion.

These various symptoms both thoracic and abdominal, may of course be present from the onset with all the evidences of shock to complete the picture of a serious trauma. Prompt intervention may be demanded. On the other hand, the symptoms may gradually develop, certain ones predominating according to the type and location of the hernia. Or, at some subsequent date, after a quiescent period an emergency may suddenly arise. So long as strangulation does not occur, the presence of abdominal organs within the chest is not incompatible with life, but ordinarily such a condition does incapacitate an individual, impairs health and in many cases terminates in strangulation.

Like that of many other conditions, the diagnosis of a diaphragmatic hernia often depends primarily upon the suspicion that it may be present. It is often missed because not suspected, but with its possibility in mind a careful history should be made, with proper evaluation of the symptoms and a search for or discovery of suggestive signs. The diagnosis should at least be suggested even before resort to the *x*-ray. The commonest signs are:

1. Tympany or dulness over the lower thorax.

2. Splashing or gurgling sounds, due to distended stomach, and

3. Heart displacements, usually dextrocardia.

The presence or absence of Litten's sign, asymmetrical movements of the costal margin and variations in the subcostal angle, as emphasized by Hoover, often assist in the differentiation of conditions characterized by elevation or depression of the diaphragm, as for instance, in the differentiation between subphrenic abscess and pleural effusions. But they may also be of value in determining impairment of the diaphragm due to the presence of hernia.

The *x*-ray of course, is of vital importance. In the ordinary *x*-ray of the chest however, the shadow may be mistaken for pneumothorax, pulmonary abscess, tumors of the thorax, thickened pleura, pleuritic bands, esophageal diverticula and other conditions, so that unless the possibility of a hernia is suspected, with the subsequent administration of an opaque meal, the diagnosis still may be missed. In every case of penumothorax or dextrocardia, hernia of the diaphragm should be suspected until disproved.

To make the diagnosis in these cases is of considerable importance for two main reasons. In the first place, as the existence of a diaphragmatic hernia often gives rise to symptoms common to other abdominal disorders, a correct diagnosis will prevent needless operations on other organs; in the second place, in those cases amenable to surgical treatment, a correct diagnosis with reparative surgery will forestall incarceration with its vastly increased operative mortality. Many of these cases, especially of the traumatic type result sooner or later in intestinal obstruction and strangulation. In Hedblom's series, 33 per cent of the cases strangulated and in 36 cases not operated upon, Lacher states that strangulation occurred with a fatal outcome as follows:

5 on the first day
10 within a month
5 within five years
5 within twenty years.

Thus it is evident that strangulation, whether early or late, is a distinct menace and its prevention is a sufficient indication for operative interference.

The operative approach in the diaphragmatic hernia is thoracic or abdominal or a combination of both, with the lowest mortality occurring in the thoracic operations. In cases of obstruction in which the cause is uncertain, a laparotomy of course is indicated. If a hernia is known

to exist and the opening in the diaphragm has been shown to be parasternal, a laparotomy here also is best suited to meet the conditions. Otherwise the thoracic route is usually preferable, gives a slightly lower mortality and offers a better chance for a successful closure of the hernial opening. In Hedblom's series, the total operative mortality was 33.6 per cent, that in obstructed cases being 53.1 per cent and in the non-obstructed cases 23.4 per cent. According to the operative approach, the mortality in laparotomies was 42.9 per cent, in thoracic operations 19.8 per cent and in the combined operation 26 per cent. The cause of death in most cases is shock, next in importance in the laparotomies being peritonitis, and finally in both types of operation empyema and pneumonia. Pleural effusion is the commonest complication in either type, which is frequently non-purulent but may go on to empyema.

The reduction of the hernia is often difficult as indicated by the numerous procedures resorted to for that purpose. Digital dilatation or incision of the hernial ring, deflation of the stomach by means of a stomach tube or even aspiration through the gastric wall, resection of the omentum and the induction of pneumothorax to overcome the suction effect of the negative thoracic pressure have all been employed. It is possible that spinal anesthesia by its lessening of the caliber of the gut might also be of material assistance in facilitating the reduction.

If reduction is impossible, a gastro-enterostomy is sometimes indicated, or enterostomy in cases of obstruction. When possible the hernial opening should be repaired by suture or some plastic procedure, or if it cannot be completely closed, the omentum, stomach, spleen, liver or colon may be sutured to it to close the gap and prevent recurrence. The aspiration of air from the pleural cavity at the completion of the operation will facilitate the expansion of the lung.

CASE REPORT

G. B., an adult Swede, fifty-three years of age and a carpenter by occupation, admitted to the Mary Immaculate Hospital, Jamaica, N. Y., on March 11, 1929. While framing a second-story window, he had slipped and after a fall of 14 to 16 feet, had landed across a 3 in. beam striking and severely injuring the right side of his chest. After being brought to the hospital in a moderate degree of shock, he was able nevertheless to walk into the ward, though slightly cyanotic, with an irregular pulse of poor quality and complaining of severe pain in the right chest. Occasional coughing spells with an expectoration of thick, yellow mucus, accompanied by cyanosis and rapid, shallow respirations, were a definite feature of his initial symptoms. When he was admitted, examination of the chest showed a slight deformity in the contour of the right side with apparent depression and limitation of motion on respiration. Tenderness was marked and on palpation subcutaneous emphysema was elicited as well as crepitus over several ribs. On percussion there was hyper-resonance over the lower right chest posteriorly and especially in the midaxillary line. The apex beat of the heart was in the sixth space, 5 in. from the midsternal line. At this time there was no suspicion of a diaphragmatic injury, though moderate rigidity of the abdominal muscles in the right upper quadrant together with the character of the injury and the patient's general condition naturally suggested the possibility of trauma to the liver, kidney or other abdominal organs. There seemed however, no indication for operation, though patient vomited several times and in fact, for the first three or four days vomited persistently. The admission blood count showed a leucocytosis of 15,000 with 85 per cent polymorphonuclears.

An ordinary *x*-ray of the chest as taken the following day, the report of which was as follows: "Fracture of the 2nd rib in the midaxillary line. Comminuted fractures of the 10th and 11th ribs 1½ inches from the spinal articulation. Fractures of the 7th, 8th, 9th and 10th ribs in the mid-axillary line with moderate displacement of the fragments. The costophrenic angle on the right side is moderately obscured. Above this is an area of diminished density, greatly simulating a pneumothorax. The right lung is displaced upward and inward toward the mid-line." Aside therefore, from

the diagnosis of multiple fractures of various ribs and the presence of an exudate, probably sanguinous, in the right chest cavity, there was a displacement of the lung and an area of diminished density greatly "simulating a pneumothorax."

The shadows in this particular area however, resembled somewhat the appearance of gas within the bowel and a progress note was therefore made that the presence of a diaphragmatic hernia should be born in mind. A few days later when the patient was able to tolerate it, a barium meal was given and a gastrointestinal series made, the presence of a diaphragmatic hernia into the right chest thus being demonstrated. As shown in the accompanying plates, the contents of this hernia comprised the bulb, the upper portion of the pylorus, half of the ascending colon, the hepatic flexure and the proximal half of the transverse colon.

The patient however, refused operation,

Fig. 1.

Fig. 2.

Fig. 3.

Fig. 4.

Fig. 1. Plain plate showing multiple fractures of ribs. Note area of diminished density, "simulating pneumothorax."

Fig. 2. Three hours after ingestion of barium meal. Note pylorus and bulb drawn up toward area of diminished density in thorax.

Fig. 3. Six hours after opaque meal, showing upper portion of ascending colon, hepatic flexure, proximal portion of transverse colon and pylorus herniated into right pleural cavity.

Fig. 4. Six and one-half hours after opaque meal.

and up to the present time with a cessation of most of his symptoms, it has not become urgent. During his stay of eighteen days in the hospital, his condition gradually improved, but for three months after his discharge patient had occasional vomiting spells lasting sometimes two days. Since then he has now been free from vomiting, but he still complains of pain, occasional cough and shortness of breath on exertion. Expansion of the right chest is still impaired, breath sounds are still diminished at the right base, there is dulness posteriorly up to the sixth rib, the liver dulness anteriorly is normal, but between the two in the midaxillary line is a definite area of tympany which is striking and unmistakable. This man still refuses operation though he realizes that his "kitchen stove is in his bed-room"; and from the compensation standpoint, in spite of the history of extensive injury, multiple fractures of ribs at the site of hernia, the development of hemothorax, the symptoms of cough and vomiting together with cyanosis, and the demonstration of a hernia through the periphery of the diaphragm, the question is still being argued as to whether the hernia if it exists at all, is traumatic or congenital.

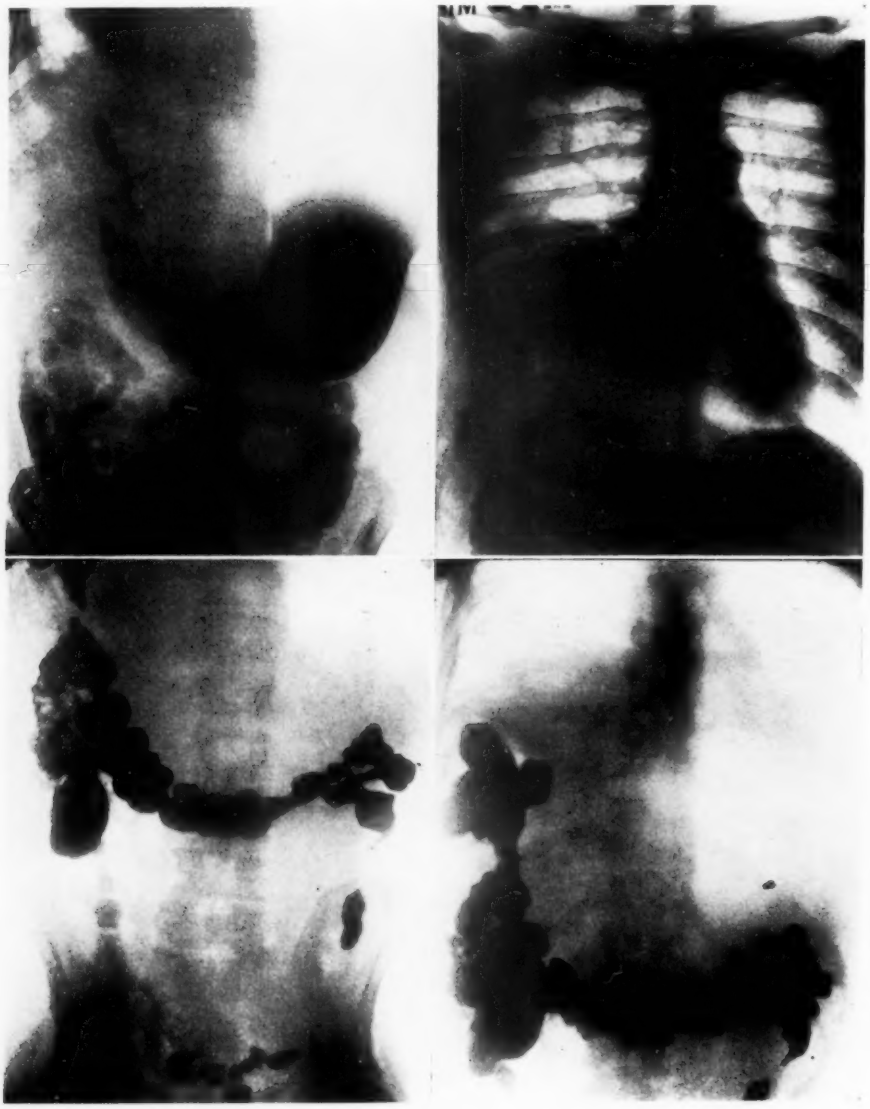


Fig. 5. Fig. 6.

Fig. 7. Fig. 8.

Fig. 5. Eight hours after opaque meal.
Fig. 6. Twenty-four hours after opaque meal, showing evidence of hemothorax as well as protrusion of gut into pleural cavity.
Fig. 7. Twenty-four hours after opaque meal, showing constriction of colon at hernial ring.
Fig. 8. Twenty-four hours after opaque meal, showing colon high in thoracic cavity.

[Note: For references see author's reprints.]

THE ROENTGEN-RAY DIAGNOSIS OF POLYPI OF THE MAXILLARY ANTRA*

HOWARD P. DOUB, M.D. AND ANDREW R. MCGEE, M.D.

DETROIT, MICHIGAN

THE roentgen-ray examination of the paranasal sinuses is being used so extensively that is has become almost a routine procedure by many rhinologists in cases where there is the slightest doubt as to the pathology present. This is especially true in those cases where one is searching for a hidden area of focal infection. A considerable percentage of such cases are without symptoms and the *x*-ray is used for an analysis of the anatomic and pathologic picture.

Polypi of the maxillary antra occur much more frequently than was formerly believed. This difference in the number found has largely been brought about by the evidence disclosed by the roentgen examination. These polypi may be seen in profile by plain films of this area or indirectly by the pressure defect produced on a column of an opaque medium injected into the antrum.

The structure of the mucous membrane of the antrum is such that, when it is exposed to acute and chronic inflammation, polypi are prone to develop locally. These polypi may or may not be associated with nasal polypi, but are more apt to be sessile than pedunculated as is often the case with nasal polypi. They may fill the antrum and protrude through the orifice and give the appearance of nasal polypi, in which case, of course, intranasal excision is of no avail. Much debate has ensued over the question of the relationship of these polypi to true neoplasms; but it is impossible here, as elsewhere, to differentiate clearly between the products of chronic inflammation and neoplasms.

Grossly, they are usually a mass of soft, edematous, polypoid tissue having a somewhat pinkish color. They may, however, be tough and stringy with a more solid consistency. They also frequently show lobulation. Microscopically they are often covered with columnar epithelium which may show some desquamation. The glandular structures may show hyperplasia. There is usually an inflammatory edema present. Sometimes the cellular infiltration predominates and sometimes the edematous reaction is more marked. Eosinophilic infiltration of high degree is often present.

The relationship between chronic disease of the paranasal sinuses, and upper respiratory infections, various lung conditions and asthma has been repeatedly described. It has been found that it is in these cases of chronic sinus disease, where the symptoms of the disease are so slight and where the washings from the antrum often return clear, that one must look for the source of many secondary diseases of the respiratory tract.

There is little doubt that many cases of these polypi and mucoceles are the result of chronic inflammatory processes in the antrum. The amount of polypoid formation, however, is not always in proportion to the amount of secretion present. Some have observed that in the pronounced suppurative processes one is less likely to find this condition than in the mucopurulent affections. In certain cases with very large polypoid growths secretory disturbance may be scanty or absent.

The best position for examination of the antra is that described by Waters and Waldron[1] in which the chin rests on the film holder and the nose is raised sufficiently to throw the base of the skull below the antra, thus giving an unobscured view of these. The lateral view is also useful in certain cases.

*Submitted for publication March 27, 1930.

Formerly plain films were made of these areas but since the introduction of lipiodol, by Sicard and Forestier, in 1922, for the outlining of hollow bodily cavities, it has gradually been used more and more in the paranasal sinuses. It is of particular value in the antra as polypi are prone to develop in antra which have been the seat of inflammation, and therefore the mucous membrane in many cases is so thick that the resulting clouding of the antrum obliterates the shadow of the polyp on the roentgenogram. In such cases the rounded pressure defect of the column of lipiodol gives evidence of polyp formation just as a similar mass in the stomach produces a defect of the barium column.

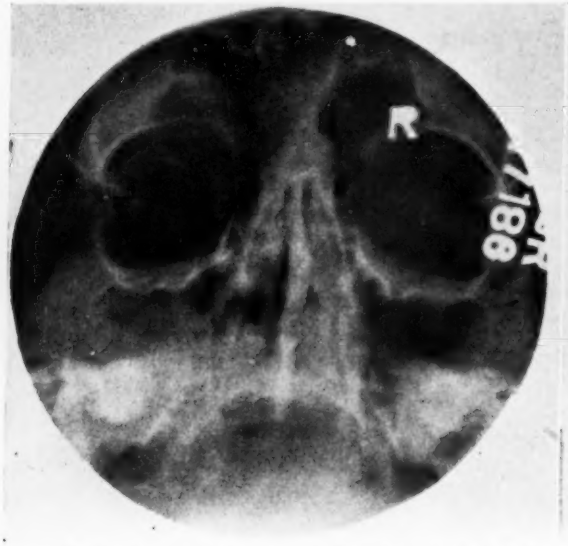


Fig. 1. This shows a large round polyp in the left antrum.

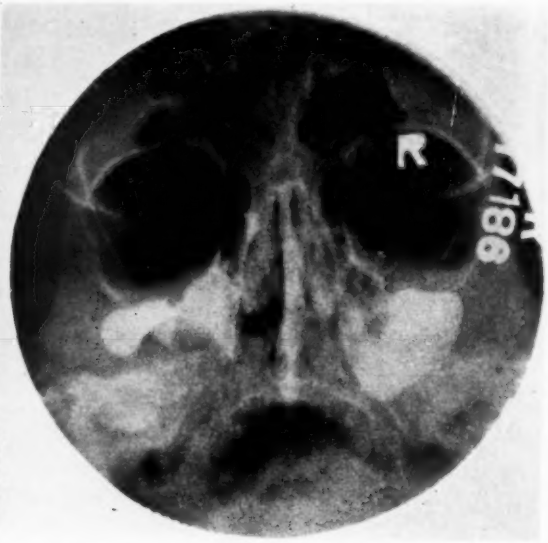


Fig. 2. Same case as Figure 1, showing displacement defect in lipiodol shadow.

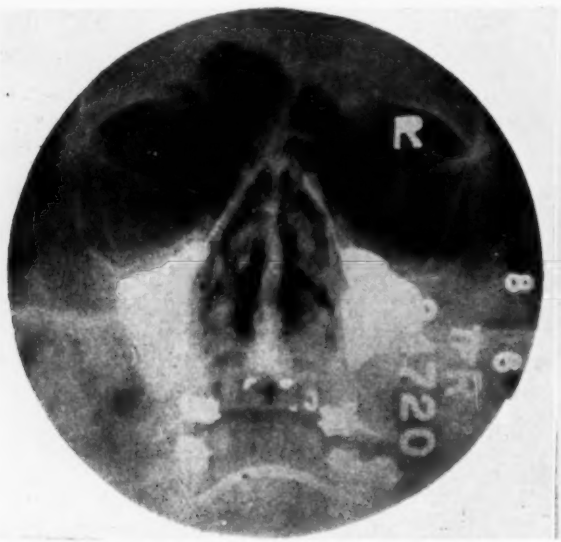


Fig. 3. Pressure defect in base of right antrum.

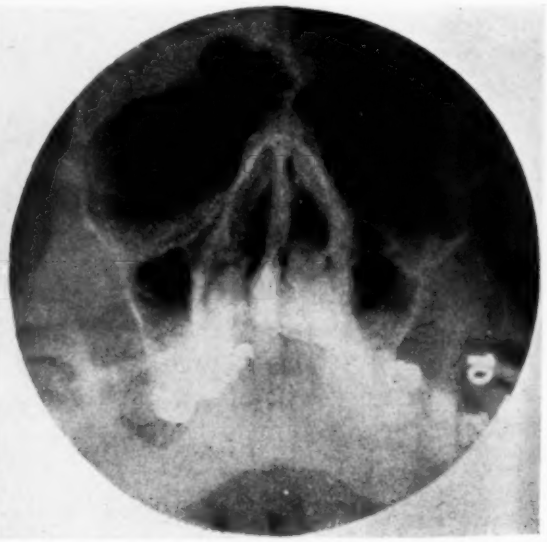


Fig. 4. Same case as Figure 3. Plain film showing polyp in right antrum.

In the introduction of the lipiodol the direct injection is ordinarily used for the antrum as opposed to the suffusion method

which is most useful in the other paranasal sinuses. The lipiodol is diluted with olive oil or liquid petrolatum until the iodine content is from 10 to 15 per cent. This can be injected at the time diagnostic drainage is done without any particular additional discomfort to the patient. With packing in the nose, the patient can then be transported to the *x*-ray department without any appreciable loss of the opaque medium.

The diagnosis of antral polyp is made from the roentgenogram when a more or less rounded or dome-shaped shadow is seen in an antrum which is otherwise air-containing. These occur most frequently in the base and on the lateral margins, but they may occur in any part of the antrum. A clouding of the entire antrum, especially if of uneven density, in a patient

Fig. 5. Plain film showing polyp in base of left antrum.

Fig. 6. Same case as Figure 5, showing lipiodol appearance in lateral projection.

Fig. 7. Plain film showing a polyp in base of left antrum.

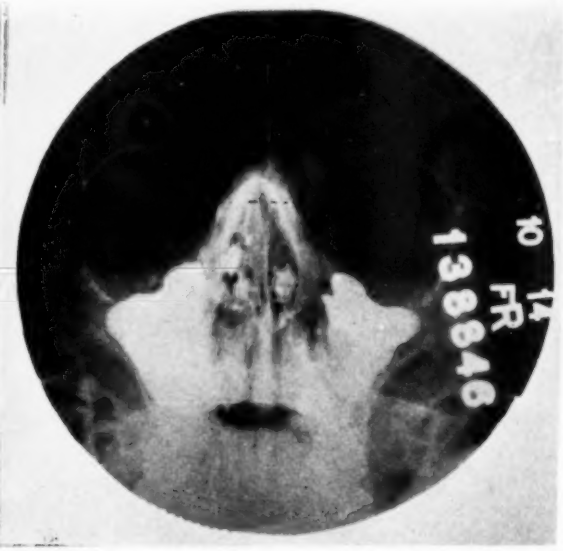


Fig. 8. A case of polyp on medial wall of right antrum shown only by lipiodol.

with chronic recurrent infection usually means polypoid formation, and it is in this class of patients particularly that lipiodol is of value. The lipiodol injection also shows the thickness of the mucous membrane lining of the antrum with an exactness that can be obtained in no other way. In some cases with the aid of lipiodol a thickened mucous membrane will be found with only one small area showing beginning polypoid degeneration.

In a series of these cases in which we have reported antral polypi from plain films 21 cases have been operated upon and the diagnosis confirmed in 19 cases, or 91 per cent. It might be noted here that in one of the two unconfirmed cases, the operative notes are such that one might infer that some polypoid tissue was removed although it was not definitely named as such. In this case the roentgenogram was usually definite.

In another series in which the diagnosis of polypi was made with the aid of lipiodol 20 cases were operated and polypi removed from 19 of these cases with a correct diagnosis in 95 per cent of the cases.

In still another series of 15 cases the diagnosis was made from the plain films and confirmed after lipiodol injection. At operation all of these cases yielded polypi with a correct diagnosis of 100 per cent.

From this series it is seen that a correct diagnosis can be made from the roentgenograms in a very high percentage of cases. In a series reported by Drea,[2] using plain films only, there were 19 operative cases with polypi found in 18, or 95 per cent. In a series of 7 operative cases reported by Waters and Doub[3] polypi were found in 5 cases and mucoceles in 2 cases. Inasmuch as a differential diagnosis between these cannot be made from the roentgenogram, this would be counted as 100 per cent correct diagnosis.

SUMMARY

From a review of the literature and of our cases, it becomes evident that the roentgen-ray examination of the maxillary antra is a very definite aid in diagnosis, particularly in those chronic cases with few localizing symptoms. An additional advantage is gained by an examination following the injection of the antrum with lipiodol. Polypi of the antra and thickening of the mucous membrane are shown with a high degree of accuracy as proved by the reported operative statistics.

BIBLIOGRAPHY

1. Waters, C. A. and Waldron, C. W. *Am. J. Roentgenol.*, 2: 633–639, 1915.
2. Drea, W. F. *Ann. Otol., Rhin., & Laryng.*, 26: 341, 1927.
3. Waters, C. A. and Doub, H. P. *Am. J. Roentgenol.*, 4: 470, 1917.

THE X-RAY DEPARTMENT OF A TEACHING HOSPITAL*

JAMES T. CASE, M.D.

CHICAGO, ILLINOIS

FOR two decades or more the subject of this symposium has been under discussion by teachers of radiology, so it is scarcely to be hoped that in today's remarks anything essentially new can be added. Rather, we may hope to crystallize thoughts advanced on various occasions at meetings of the national societies devoted to the specialty of radiology and at previous meetings of the nature of the present one, sponsored by the American Medical Association, the American College or Surgeons and the American Hospital Association.

The teaching of radiology is a subject on which complete agreement has not been reached. That it should be taught is taken for granted, but how much effort should be devoted to making radiologists out of undergraduate students, or even graduate students not specializing in radiology, is not agreed upon. Undergraduate, and even graduate, teaching requirements differ much from those of institutions or departments devoted to the instruction of prospective radiologists. The latter require knowledge of a wealth of detail relating to technical matters, electrical and mechanical principles and apparatus involved in the production and manipulation of the roentgen rays, as well as the needed medical training and experience. Further, the radiological specialist must spread this training and experience over a large field, embracing almost every branch of medicine. Like pathology, medical radiology finds application in a large percentage of patients; indeed, radiology may be likened to pathology in vivo. It is patently impossible in any scheme of undergraduate or rotating interneship teaching to expect to give the student the necessary preparation to practice radiology.

The purpose, then, of a department of radiology in a teaching hospital should be to furnish the appropriate assistance in the routine examination and therapeutic management of patients; to participate in staff conferences; to contribute to the instruction of internes and undergraduate students on the application of radiology to the problems of diagnostics and therapy—on the possibilities as well as the limitations of the roentgen ray aid; to help in various research problems as they present themselves; and to assist in post-mortem examinations.

Parenthetically, it is proper to call attention to the fact that the hospital management should not look upon the radiological department as a profitable investment, and it should not be the aim of the department to contribute to the financial standing of the institution until all the foregoing objects have been achieved. There is no more justification for the hospital to capitalize the experience of the radiologist, than to put the operating room on a fixed fee basis, pay the surgeons and nurses salaries, and credit the profits to the income of the hospital.

In order to meet the foregoing aims, the physical equipment of the hospital should include standardized *x*-ray equipment for radiography and fluoroscopy and for *x*-ray therapeutic work, housed in rooms of sufficient size to permit demonstrations to students and internes. Instruments for biplane fluoroscopy to be employed in the setting and splinting of fractures, a combined roentgenoscopic and roentgenographic cystoscopic table, a special table for gynecological *x*-ray studies, such as salpingography, hysterography and inflation of the uterine tubes, and proper equipment for high tension deep therapy are

*Department of Radiology, Northwestern University Medical School.

Presented at the Annual Congress on Medical Education, Medical Licensure and Hospitals, Hospital Department of Radiology, February 19, 1930.

almost necessary in a large hospital, whether or not employed for teaching students.

The personnel must include a medical radiologist, with such physician and lay assistants as the volume of work demands. The larger hospitals may justify a staff of radiologists, so that under the director of the department, who may elect some specialty of medicine in which to expand his radiological effort several associates may be developed with special aptitude in the radiology of other specialties, so that the entire field of medicine may be covered with a maximum of radiologic service.

The hospital management must not look upon the radiological department merely as a photographic center for the production of pictures to be interpreted by the various surgeons, internists or other specialists who may have ordered the *x*-ray studies. There is a growing tendency to look upon the *x*-ray department as just such a photographic center, where patients are sent to have roentgenograms made, after which the resulting concrete records are asked to be sent to this or that ward or to this or that office, where the original referring physician often appears to be willing to make his own readings and seems perfectly content to assume full responsibility for the radiological diagnosis. Precedent for this was established long ago in regard to roentgenograms of fractures and dislocations, and often times with foreign bodies, and has come to be considered in many quarters as the perfectly proper procedure for the orthopedic department; but we should recognize it as the beginning of a new departure. We should look well ahead to see whither it leads. Does it mean that the chest films are to be sent to the chest department, the gastrointestinal films to the gastroenterological department, the head films to the neurological department, etc.? If so, what other future can be seen for the roentgen department than as a photographic laboratory, and what need for an experienced physician-radiologist in such a place? Such a scheme would scrap the benefits of fluoroscopy, unless the radiological department, like an operating room, be opened to all members of the hospital staff, and, even then, the average efficiency of the screen work would be low. My firm belief is that such a development would result in setting back the clock of radiological progress many years, for it would mean abandonment of all help obtainable from screen examinations by a physician-radiologist with his accumulated experience of many years in examining patients from all departments of a hospital. There is little tendency for the radiologist to fall into a rut, to see problems from a single angle, for he is constantly influenced by the diverging opinions of his colleagues in all departments of the hospital, and has a better opportunity than most physicians to realize fully the fault of getting into a rut, and the need of maintaining a receptive mind.

The above remarks should not be interpreted as intimating that an internist, a surgeon, or any other specialist has not a perfect right to fit himself in every possible way for the practice of this specialty; and if he wishes to utilize the roentgen rays as one of the methods of examination, there can be no logical objection raised to his use of this procedure. It is his need to see that he has had sufficient training under expert tutelage for the radiological work. But if the hospital should be so unwise as to divide up its radiological work, apportioning it out to various departments, there would be lost that great help to physicians, surgeons and radiologists, which comes from frank discussion of the roentgen findings, both screen and film records, between radiologist and referring physician, and their proper evaluation in the light of the clinical aspects of the case brought out in such a discussion.

The reports of *x*-ray findings should be full of details, but every such detailed record should also contain a line or two of summary for convenient quick reference

and for cross-indexing. It is our custom to attach a copy of the report to the patient's chart, where it is available at all times for study by the students, internes and clinicians, and also to affix a carbon copy of the report to the *x*-ray department folder containing whatever film records are filed. Cross-indexing provides a means of aiding in research and follow-up, both of which are essential in teaching institutions. The complete record of observations in the detailed report already referred to may prove of great value in future research problems and should form a part of the permanent case records.

The roentgenological diagnosis must be arrived at by a process of reasoning and argument, just like the clinical diagnosis. The films do not come out of the dark room with diagnosis labels filled out. By a process of considering all the possibilities and eliminating them until the probable diagnosis remains, the roentgenologist reaches a conclusion. He may not be able to put a name to a condition which he studies, unless he draws upon other than roentgen evidences for his information, and this is something which I believe should always be done for the advancement of the radiologist but which should never be done in the written *x*-ray report. The roentgen report should contain only statements which can be substantiated from roentgen evidence. This report will then take its place with the other evidences of the case, from which the clinician in charge will then draw his conclusions; "*but*" (and this is a very important "but") if the staff has the slightest interest in the development of a capable roentgenologist with ever increasing usefulness, they will leave no stone unturned to keep him posted in regard to his cases, tell him of his success as well as his failures, send for him when the surgeon or pathologist has let the light of day upon a lesion which has been baffling.

In the light of what has been said, it is apparent that the examination and the interpretation of the examination findings will be all the more valuable and helpful if the roentgenologist is furnished with the history and such clinical data as are available up to the moment of the roentgen study. This will enable him to focus his attention upon the probable lesion and will permit him to exercise some of the tricks which he may have learned to brush away the fog a little more efficiently than if he is merely asked to examine this or that tract. The roentgenologist, once proved to be a man worth cultivating, should not be treated as though he were a student perpetually on examination and each patient sent to him as a catch problem, but he should be looked upon as a colleague and be provided with every fact likely to assist him not only in the interpretation of the case in hand but also in his development into a better, broader and more useful consultant. The roentgenologist may render valuable help in the early diagnosis of postoperative ileus, in the discovery of subphrenic abscess and in the proper placement of drainage tubes. In postoperative pneumonias and other respiratory complications, the roentgenological films sometimes constitute decisive information. A sympathetic cooperation between the radiologist and the surgeon or internist in these types of cases will result in deviation from the old approved methods and result in valuable research in new methods and in new applications of old methods.

As Barclay has suggested, the roentgen department is full of intensely interesting work; it may be likened to a profusely illustrated book. The illustrations come automatically from all departments of the hospital and from outside patients. The value of the illustrations can be considerably enhanced if there is a close sympathetic cooperation between the pathologist and the roentgenologist; and it would be an advantage if the two departments were physically closely associated.

It transpires in most hospitals that a very large proportion of these cases find their way to the roentgen department, and if the pathologist and the roent-

genologist are working together there is thus afforded a great opportunity for these two workers to see that there is made the most possible out of the wealth of material which accumulates. In this manner, the roentgen department may constitute a bureau of information concerning material available from the unique position occupied by it as a link in so many diagnostic chains. Again quoting Barclay, the roentgenologist has a great opportunity to help link up scattered units of a hospital which tend to get further and further away from each other, each absorbed in itself and not knowing what goes on in other units; and he should be able to break down barriers which have a tendency to spring up in big hospitals by making the *x*-ray department a common meeting ground for physicians from all departments of the institution. [For discussion of this paper see p. 1060.]

THE REQUIREMENTS OF A DEPARTMENT OF RADIOLOGY IN A LARGE MUNICIPAL TEACHING HOSPITAL*

P. F. Butler, M.D.

BOSTON, MASS.

THERE is no essential difference between a municipal hospital and an endowed one. Both hospitals have the same objects in view, to relieve suffering, study disease and train young doctors. Endowed hospitals may keep patients for a longer time while undergoing study. Municipal hospitals must discharge patients as soon after their recovery as is practicable. This is especially true of a municipal hospital which does not contain proportionately the requisite number of beds for the community.

For greater simplification the subject here considered is divided into the following chapters:

1. Organization
2. Physical plant
3. Fire hazard
4. Political interference
5. Health of workers
6. Abuse of department
7. Training radiologists
8. Teaching
9. Research

Organization: In the organization of a radiological laboratory of the large municipal hospital there must be a chief radiologist, medical assistants, medical internes, technicians, nurses and clerks, depending upon the size of the clinic. The chief should be a well-trained and experienced medical man with a sound knowledge of clinical medicine and surgery and, of course, must be an expert in radiology. The hospital must make it worth his while not only to take the risks of his calling but also to keep himself abreast of his branch of medicine. He must be responsible for all work turned out, materials used, upkeep of apparatus, selection of house officers and safety of patients and working force. He should have the necessary medical assistants and so subdivide the work of the clinic that each assistant is responsible for his particular division. In some cases the chief should be a man who gives all his time to the laboratory, but this means a substantial salary and the privilege of charging private patients. Often this scheme is not practical and the problem is solved by a part-time man who may still carry on his private practice. Smaller hospitals may be run on a percentage basis but this cannot be done in a municipal hospital because the percentage of non-paying cases runs from 70 to 90 per cent of all the cases seen and furthermore the private patients are usually those who cannot afford to pay more than a small fee. The assistant physicians in the department should not be expected to spend more than a half day because they could not be paid enough to reward them for their time. The resident radiologist, a young graduate, should give all his time and be paid a reasonable salary. The internes are paid in some hospitals but are not as a general rule. One assistant physician should be responsible for all material bought and used and make a monthly report to the chief. Another is responsible for the proper upkeep of apparatus and meters. The resident radiologist, who should be a graduate radiologist, is responsible for the conducting of the department in the absence of the visiting staff. Technicians may be male or female. It has been our experience that hospital work is too exacting and trying for female technicians, and we have found that male technicians accomplish more even though they are not as amenable to discipline. There is now a registry for technicians which is

* Presented at the Annual Congress on Medical Education, Medical Licensure and Hospitals, Hospital Department of Radiology, February 19, 1930.

endorsed by the Radiological Society of North America, where competent registered technicians may be obtained. The technical staff should be instructed in the theory, practice and dangers of the work. The efficient department gives twenty-four-hour service; therefore a night technician or interne must be available at all times for emergency work. The value of this service is frequently seen, for instance, in cases of children where diagnosis can only be made by *x*-ray as between a central pneumonia and acute appendicitis.

Physical Plant: Roentgen-ray apparatus is expensive to buy and to maintain. Most of the modern *x*-ray depends largely upon the type of clinic and the personal experience of the radiologist. A general clinic requires several different types of apparatus and it is advisable to have separate rooms, where possible, for gastrointestinal work, chest work, renal work, etc. The installation of apparatus should be supervised by a radiologist who is conversant with all the requirements and dangers of the work. This should never be left to the dealers alone. The current may be direct or alternating. It may be supplied by the hospital power plant or brought in from the local electrical company. Whichever is used, there should be a free single line to the *x*-ray department with no elevators or other machines on it. This main line must be made of sufficiently large copper wire to obviate any appreciable loss of current. A recording volt meter on the incoming line near the main switchboard keeps accurate record of the voltage delivered to the department. The main switchboard should be in a dry, accessible location. All switches should be labelled and of the safety type. A separate wire from the switchboard to each room insures against breaking down in more than one room. All wires should be carried in conduits. Each operating room should have its own wall switch. At night the main power switch on the central board should be cut out, disconnecting all machines in the department. This is necessary to guard against outsiders turning on machines during the night and is also a wise precaution in case of fire. Throw switches connecting two rooms with high tension electricity should not be allowed. Portable machines are necessary for examining patients who are too ill to be brought to the department. The actual care of each machine is in charge of its individual technician and once a month all of the machines need servicing by regular service mechanics from the dealer. Every meter should be calibrated once a week with a standard meter. The standard meter should be calibrated about every four months by the manufacturer. Standardization of machines and tubes so as to give as nearly uniform a technic as possible is the ideal method for a large department. Charts posted over the control cabinets giving definite settings for each examination make this possible. The technicians should be required to follow these charts. This means great simplification of the developing room work because time developing of large numbers of films is thus made possible.

The location of the department should be central in the hospital plant, so as to be readily available to all other parts of the institution. The following table illustrates the distribution of cases in our hospital for the year 1929 and emphasizes the need of a central location:

Total ward patients	19,463
Total out-patients	14,385
Total outside doctors' cases	4,083

The department should be arranged so as to allow a continuous flow of patients in one door and out another, thus avoiding congestion. Because of the high cost and intricate mechanism, roentgen-ray machines should never be placed in dark or damp places, especially basements. The apparatus must be accessible at all times for workmen. It also is particularly susceptible to dampness. High tension wires attract dust and quickly become fouled unless constantly kept clean. The department is best placed on the first and second floors with ample window space and

ventilation. Elevators should be large enough to carry a ward bed patient with both legs in abduction plaster apparatus. Sliding doors are preferable to swinging ones. The walls should contain thin sheet lead to a height of about seven feet. Control machines are best placed behind lead or lead glass shields, so as to compel the technicians to retire behind this protection while making exposures.

Ventilation and sunlight in every room are quite essential. Some observers believe that poor ventilation and lack of sunlight have contributed more to ill health among roentgen-ray workers than any other cause. Certain it is, that since *x*-ray departments have been moved out of dark basements, the incidence of impaired health among the workers has greatly lessened. The best arrangement for ventilation is to have an exhaust fan in every room which draws out the foul air through ventilating shafts. This should be supplemented by openings above each window, which may be regulated, for admitting fresh air from the outside.

For dressing rooms the best plan is a row of steel lockers adjoining a small dressing room. The patient undresses in the dressing room, puts on his hospital gown and then places his clothing in one of the steel lockers and locks it. This arrangement does away with the necessity of large dressing room space. It also prevents theft and contamination of one patient's clothing by that of an unclean person.

Fire Hazard: This subject cannot be emphasized too much. There should never be a repetition of the frightful holocaust which occurred earlier this year. In spite of all the investigations and reports arising from this tragedy many communities are still as open to disaster as they were before. Many excellent recommendations were made for the prevention of fire and explosion and it is almost criminal not to follow them. Fire and explosion from *x*-ray films in a hospital filled with bed-ridden patients is unthinkable, but can we all say that such a calamity can never happen in our own hospitals. If the safety type of film is used the fire hazard is negligible. As a matter of fact, this film is no more dangerous than so much office stationery. The nitrate film should not be allowed in any institution. It is highly combustible, gas-producing and explosive. The safety type of film costs about 20 per cent more than the other, but the added expense is good insurance against fire or explosion. Water is the most efficient agent against fire. Therefore, the entire department should have a first-class sprinkler system, with extra large supply pipes and oversensitive sprinkler heads. Windows in film storage rooms should be made of very thin glass so that they will blow out easily in case of fire, thus letting the smoke and gas out into the air. Fire hose and extinguishers should be placed at strategic points throughout the department. No smoking is allowed. Automatic fire alarms are helpful. Current films must be kept in the department for handy reference but all other films should be stored in a fireproof out-building. In our state the statute of legal limitation for law suits is six years, and because of this we preserve all films for seven years. Films older than that are not of much use in a given case anyway, because of the changes occurring in most physical conditions over that period of time.

Political Interference: This is largely a bugaboo. From my own experience and that of others in similar positions, it is only fair to say that there is no more meddling by politicians than there is by favored friends in other hospitals. We have been told by men of prominence in political life that practical politicians never wish to meddle with hospital organizations or interfere with their purchase of supplies and equipment. All positions should be under civil service regulations. These regulations allow the head of the department ample latitude in selecting his technical help and eliminate the undesirables from

consideration. Selection and purchase of equipment should be in the hands of the director. If he has the confidence of the hospital authorities in his judgement and integrity there should be no difficulty in these matters. There is generally an ordinance requiring that all purchases above $1000 must be let out on bids. This situation is easily handled by incorporating careful specifications for the bids. The specifications used by the army and navy are excellent models to follow.

Health of Workers: The first concern of the radiologist must be the safety of the patient. Each radiographic patient, however, receives such a small amount of exposure that there is practically no danger of over-exposure. The treatment cases, on the other hand, must be surrounded with all the necessary precautions. All treatments must be supervised by one of the radiologists, who understands the dangers. All workers with roentgen ray or radium should have ample time off from duty. One month each year is not too much. They should be instructed to spend as much time as possible out in the sunlight. This vacation problem is a difficult one when working for a municipality, because as a rule vacations are regulated by city ordinance. This ordinance permits of no exceptions and is unfair to workers in hazardous occupations such as ours. Radiologists and their technical help must be watched for signs of physical breakdown. Regular blood studies should be made to discover signs of blood disturbance. If this condition is found, a quick vacation is the best method of treatment. A fairly reasonable amount of sick leave is granted by most cities, but it is not enough for those in hazardous occupations as those filled by our technical help. The United States Government allows all its employees thirty days a year for vacation and the same allowance for sick leave. This is about what our technical help should receive. Responsibility for the health of the working staff is a worrysome burden and the chief of the department should be allowed more latitude in regulating their working hours. A recent court decision in New Jersey has placed this responsibility directly upon the employers in a radium factory. If then, we who employ people in this dangerous work are liable for their health we should be allowed to use all the necessary safeguards against physical breakdown. Perhaps I am over-emphasizing this aspect of the problem as far as *x*-ray workers are concerned, but I cannot place it too strongly before you when radium workers are concerned. The safety measures for *x*-ray workers are now quite well understood:

1. Lead-lined booths for operators.
2. Lead glass bowls for tubes.
3. Lead-enclosed tubes.
4. Ample distance of tube from operator.
5. Good ventilation and sunlight.

If these simple precautions are taken there is practically no danger to the operators. The radium problem, however, is not so easily handled, especially where the operator must handle needles, either of salt or emanation. These operators must be carefully watched for breakdowns in health.

Abuse of Department: The tendency to send cases for roentgen-ray study before being properly worked up is wrong. It lessens the diagnostic acumen of the referring physicians, especially the younger men. It requires the *x*-ray department to make many unnecessary examinations and hence is an expensive waste of time and material. Furthermore, when these internes go out into private practice they may be located where an *x*-ray equipment is not available and, therefore, they must make their diagnoses without the help of *x*-ray.

The signing of requisitions should be done by the visiting physician, except in emergency cases, when the resident or senior house officer may sign them. They must not be signed by medical students or junior internes. Executives in the main office also are allowed to sign them, but they are apt to call for unnecessary examinations, especially after people persuade them

that they wish an *x*-ray examination. Last year in our gastrointestinal division 50 per cent of the cases showed negative findings. It is reasonable to assume that a large percentage of these were booked for examinations unnecessarily. Our department history taker (a medical student) estimates that about 25 per cent of the patients he interviewed did not require barium studies.

Another annoying problem is the loss of finished films from the record room. These films are taken to the bedside or operating room for convenience of the attending surgeon and are frequently misplaced and lost. My own feeling is that no films should be allowed out of the department and that the visiting physicians should all come to the central viewing room to study the cases in which they are interested. A possible solution for this is to make prints of the interesting cases and attach these to the clinical records, keeping the original films in the department.

It is an established principle that no hospital that is maintained by a state or city should make a profit from medical services rendered to any patient. However, it is advisable that private patients should pay a reasonable fee for private work. Misrepresentation by patients of their ability to pay is, of course, a serious consideration in all hospitals.

The principal means of cutting down expenses is by eliminating unnecessary examinations, which are the greatest cause of needless expenditures. We have derived considerable relief from this annoyance in our out-patient department, by establishing a gastrointestinal clinic: patients referred from any department for barium studies must go through this clinic first, where the need of a roentgen examination is decided. We are also called upon to examine poor patients referred for examination by doctors not connected with our staff. This service is not very large, because all these cases must pass through the hands of one of the executives, who decides whether roentgen examination is really indicated.

Training Radiologists: Up to a short time ago there was more or less difficulty in obtaining high class internes who wished to take up radiology as a specialty. The reason is that the specialty has not yet reached the high place in the minds of medical men that it deserves. This is not true of physicians in contact with good radiologists, for here the true value of the *x*-ray department as a consulting service is appreciated. Physicians not in touch with good radiologists have an idea that the work consists mostly of picture taking and that anyone can read a roentgen-ray film. This is the principal reason why commercial laboratories are flourishing. As soon, however, as these physicians become acquainted with trained radiologists and appreciate their value as consultants, they see at once that this specialty is a real medical aid in helping to solve their problems.

An interne in radiology should receive at least one year's training. He should preferably be a hospital graduate. This training begins with a course of study and practical work in the technical aspects of developing, lantern-slide making and construction of machines; in other words familiarity with chemistry, physics, electricity and other fundamental subjects. He should do all the emergency work, nights and holidays, at first under supervision but later on, when qualified, alone. He also serves under the different visiting radiologists so as to benefit by their personal ideas and experience. He should work out one original problem during his internship. He is required to follow interesting cases to the operating or post-mortem rooms. In short, his time should be carefully laid out so that after learning the fundamentals he gradually works up and through all the divisions of the work. It is also a good idea to give him some of the responsibility in buying supplies and overseeing the care of machines so as to round out his general usefulness.

Teaching: Teaching should be done in all municipal hospitals. Its value as a stimulant to the staff in keeping up to date is undisputed. It would indeed be a pity not to utilize for teaching purposes the wealth of material passing through such a hospital. Nowhere else do we have the opportunity for handling such a large volume of traumatic cases as are brought to the hospital by public ambulances and the police. With the increasing number of automobile accidents each year it is quite essential to train the prospective doctor in the handling of its inevitable train of complicated accidents. A collection of teaching films and lantern slides should be a well developed part of the department. In fact, a good collection of this sort will prove its worth as a reference library of disease and injury. Most of these cases should be checked by biopsy, operation or autopsy findings so as to make them accurate and correct representations.

Another reason for the delay in radiology reaching its proper place in the field of medicine is the attitude of medical schools. Very few of them give this specialty the amount of time or attention in the curriculum to which it is entitled. Teaching is usually done under one of the other branches of medicine. Radiology should have a department of its own. Furthermore, the teaching of many of the other branches may be made more graphic and impressive by the use of the roentgen ray. It is the experience of most teachers of roentgenology that the physiology of the mechanics of the gastrointestinal tract is more satisfactorily demonstrated to students by this method than by any other. Certainly the normal architecture of the human skeleton cannot be shown as well by any other means. Serial plates of lobar pneumonia and tuberculosis never fail to make a graphic impression on the students' minds.

No attempt is made to teach students roentgenology as a specialty. Rather do we try to have them correlate the abnormal findings with the clinical history and the physical findings in a given case. They are taught the value of interpretation and the amount of reliance to be placed upon it. They are shown enough to enable them to interpret an average film. A brief knowledge of its uses in diagnosis and treatment is about all that can be given to them in their third year. Elective courses for fourth-year students require at least one month's time. This course is more comprehensive and goes further into detail. Post-graduate teaching is given to radiologists who wish to keep in touch with the work of a large medical center.

Research: No specialty advances unless research work is being constantly done. As the specialty of radiology is one of the youngest of the medical sciences, the need and opportunity for research are unlimited. Each succeeding year sees newer uses for it. One of the greatest responsibilities of the older radiologists is to encourage and stimulate research problems. Many of the radiologists in the forward looking hospitals require one research problem a year from each of their internes and assistants. The problem may be a small one but if it contributes one new idea it is well worth while. The variety of cases seen in such an institution should be thoroughly studied for the benefit of medical science and the consequent help to mankind. [For discussion of this paper see p. 1060.]

THE REQUIREMENTS OF A DEPARTMENT OF RADIOLOGY IN A SMALL HOSPITAL*

H. J. Ullmann, M.D.

SANTA BARBARA, CALIF.

THERE is an old recipe for rabbit pie that begins, "first, catch your rabbit." The first requirement for a department of radiology is to obtain the services of a competent radiologist. It is common practice to equip a department and then look for a director, which is a great mistake. The director should be chosen and given as much latitude as possible in deciding, not only as to type of apparatus, but also organization, personnel and operation of the department, for which he should be held responsible. Where this is not done the directors of a hospital and the staff are bedeviled by the manufacturers, and often are persuaded to put in a more expensive type of machine than required, or a far more complete equipment than is needed. An experienced roentgenologist entering such a laboratory almost invariably finds it necessary to discard or change to a greater or less degree. When he does, the directors are shocked because they have been assured by the makers of the equipment that it is the very latest and best. The director should have the decision, as he must work with the machines and is held responsible for the results.

To obtain a competent director, it is necessary to offer him not only reasonable financial compensation, but satisfactory physical and professional inducements as well. In a small hospital the physical requirements must necessarily vary, not only with the number of beds, but also with the size of the community, the type of work done and the presence or absence of other hospitals in the neighborhood and their facilities. To illustrate, if the hospital is the only one within a reasonably large radius, is doing general work and the staff is a live one, the equipment should be sufficient to meet any reasonable requirement of roentgen diagnosis. With the present equipment offered by a number of reliable manufacturers, this can be done at an expenditure within the means of any hospital of 75 beds or over. By a reasonable requirement, I do not mean apparatus heavy enough to take stomachs in one-tenth second or chests at 6 ft. in the same or less time. I mean equipment that will turn out diagnostic films of any part of the body, stereoscopically, if desired. It is hardly necessary to add that a fluoroscope for both horizontal and vertical positions is an absolute necessity. If the hospital is in a large community with a completely equipped institution close by or is limited in the kind of work done, the directors must decide, after consulting with their roentgenologist, whether the department should be complete or modified to suit their special conditions. In certain instances arrangement can be made with an institution or private laboratory in the immediate vicinity to take care of special examinations or treatments. One of the most difficult decisions to make is the amount of treatment to be undertaken. The directors of a small hospital, with proper pride in their institution, may want the department to be prepared to treat any patient requiring radiation therapy, considering that the department has failed in its duty if a patient must be sent to another hospital, either at home or elsewhere, for treatment. This is a mistake. To treat all patients needing radiation therapy, and to do it properly, requires an outlay greater than for all the rest of the department. An adequate supply of radium may cost as much as the entire diagnostic equipment, and the addition of a 200,000 volt roentgen

* Presented at the Annual Congress on Medical Education, Medical Licensure and Hospitals, Hospital Departments of Radiology, February 19, 1930.

therapeutic equipment can easily double this. Even more serious is the prescribing and application of the treatment. It is easier to obtain the services of a roentgenologist capable of handling the diagnostic service and even the roentgen therapy than to find one who is also trained in the use of radium. There is no greater tragedy, except incompetent surgery, than ignorant or carelessly used radium, especially when combined with the roentgen-ray. I, not infrequently, see "situation-wanted" advertisements of technicians, who list under experience that they are trained in roentgen therapy. I know of small hospitals where the staff members refer patients to their technicians for a "series of *x*-ray treatments." Would one of the same staff refer a patient to a nurse for a "course of tuberculin or digitalis therapy?" I doubt it. No treatment should ever be given unless the entire dose, including intervals and all details, be prescribed by a physician who knows what he is prescribing and why.

Of even more importance than the physical are the professional inducements. There is nothing more discouraging to a roentgenologist, especially if he be young, than to be considered by the members of the staff as no more than a high-grade technician. This rarely applies to a large hospital, but not infrequently occurs in the smaller ones, especially if the community is small and is a considerable distance from a large city. One of the first requests a roentgenologist is apt to receive in such circumstances is for "one view of the wrist," "three plates of a barium meal," and "an *x*-ray diagnosis of the lungs." If he does not make a definite diagnosis of lung tuberculosis with full statement of the degree and probable prognosis, he is considered incompetent. Not long ago I was visiting a young roentgenologist in a small hospital. I was much surprised that, instead of making interpretations of his roentgen findings, he was making positive diagnoses without knowing anything of the patients' histories or physical findings. On being asked how he could do it, he replied that the staff required definite diagnoses and that he could not retain his position if he did otherwise. He had tried to convince the staff that their attitude was wrong, but was told that the department had been established for the purpose of diagnosis, and diagnosis they would have. No roentgen department can do its duty to its patients or its hospital until the staff will consider its director a colleague, who acts as a consultant when the roentgen ray is used, and that the laboratory is one of the means required to enable them to arrive at a correct diagnosis. The director must be allowed to take such pictures and make such fluoroscopic examinations as he considers necessary to obtain all the information possible with the roentgen ray. Therefore, bills should be rendered for roentgen examinations, not for so many films taken. The director should be limited as to the number taken in any given case. If he is not competent to judge this, he is not competent to be the director. Requisitions for department services should require that an examination be made of such and such a region, and the suspected condition. All other details must be left to the director. This also applies to therapeutics. No requests should be made for "five *x*-ray treatments of the right breasts," "one *x*-ray treatment a week to front of the face." They should read "postoperative (or pre) radiation of right breast for carcinoma," or "radiation of right breast for mastitis," "radiation treatment of face for acne." As in diagnosis, the details of technic must be left to the radiologist, and if there are special features, the referring physician should consult with him before treatment is started.

There is a part of the department of radiology that is often overlooked in the large as well as the small hospital, the use of the longer wave radiations. It is common practice to put ultraviolet generators in the physiotherapy department under a technician. This is a dangerous as well as a bad practice and not countenanced by the

American Medical Association. The time allotted to this paper is too short to go into the subject, so this statement will stand without discussion. A physician should be allowed to prescribe the dosage for his patients, if he so desires; but if he does so, he must give all the data, type of reaction desired, etc. and not simply order "quartz lamp, ten minutes, twice a week." Such an order could result in anything from almost no effect, to a severe burn, depending on distance, age of lamp, etc. It is wiser to consult with the director concerning these treatments as in roentgen therapy.

The question of the financial arrangements with the director is often a stumbling block to satisfactory service. In principle, the arrangement should be such that the hospital receives enough from the fees to cover all carrying charges, including the replacement of obsolete equipment. It should not expect to make a handsome profit from the department any more than it would from the operating room. There is usually insufficient work in a small hospital for a full-time man, but whether full-time, or not, the fairest arrangement is a percentage of gross or net income. If either, the hospital percentage should be just sufficient for replacement of obsolete apparatus and additions for a growing department. Some such arrangement stimulates the director to build up the department and increase his work, both as to quality and quantity.

The equipment of a department by the director at his own expense, and in which, therefore, all fees are necessarily collected by him, becomes, as a rule, essentially unsatisfactory. If he does not satisfy requirements, it is difficult for the hospital to make a change and conversely, it is difficult for him to change if such appears to his best interests. There is one exception, the ownership of radium and deep therapy equipment. In this instance the physician, who will usually confine his practice to radiology, if he is willing to invest such a large sum in equipment, finds it to his advantage to have his high voltage machine in the hospital. It is economically unsound for a small community to have two large equipments operating, one at the physician's private office, and one at the hospital, when there is only enough work to keep one machine running half the time.

There has been no attempt to discuss more than general principles. Each institution must necessarily be an individual problem, but it is believed that these will apply to all. [For discussion of this paper see p. 1060.]

RELATION OF A HOSPITAL DEPARTMENT OF RADIOLOGY TO THE PRIVATE RADIOLOGIST*

L. R. SANTE, M.D.

ST. LOUIS, MO.

IT will be conceded by all that Radiology has become an indispensible aid in the diagnosis and treatment of disease, and that it must be available for the service of patients and aid of the physicians in every well regulated hosptial. It is essential therefore that the hospital management make every effort to secure adequate radiological service. While the need for this service is universally understood, there does not seem to be any uniformity of opinion as to just how this is to be brought about. In order to secure the opinion prevailing among radiologists throughout the country a questionnaire was sent to 125 men prominent in this specialty. The information obtained in these questionnaires serves as a basis for the following paper.

A wide variety of arrangements are now in use by various institutions, which seek to provide them with efficient radiological service. These arrangements vary of course with the size and type of institutions which they serve. Some are large enough to require the entire time of a radiologist, others may operate on a part-time basis; some are largely charity institutions, while others may be used entirely for private patients; some may be affiliated with medical schools where teaching of students and internes plays a prominent part in the activities of the department.

It is not within the province of this paper to analyze the requirements of hospital radiological departments, but it is my purpose to point out certain fundamental requirements which are essential to the Radiologist for the successful administration of his department. Well meaning hospital boards who desire to advance radiology as a science would do well to give their earnest consideration to the manner in which their radiological departments are administered. No radiology department, no matter how elaborately equipped can give adequate service to its clientele or render proper aid to the hospital physicians depending upon it, unless it is in charge of a competent trained radiologist. By competent trained radiologist is meant a graduate physician who has had at least sufficient experience in general medicine to provide an adequate background for his radiological work. His subsequent training in radiological practice should be under some preceptor of acknowledged capability in a large well-regulated laboratory and should be continued until his instructor is convinced that he is capable of assuming individual responsibility. It may be depended upon that in this, as in any other field, his opinion will be valuable in direct proportion to his previous experience. The radiologist should be a man of sufficient experience to render his opinion valuable to the members of the staff with whom he will be called upon to consult. The recent tendency of some institutions to install young men, on small salaries, fresh from their hospital internship without practical medical background or adequate radiological training, as heads of hospital radiological departments to pass their opinions upon matters vital to the welfare of the patient and to consult with established practitioners, is an insult to the intelligence of the physician and an injustice to the patient. This effort by lay hospital boards to reduce the cost of medical care at the expense of the radiologist will be found a dearly purchased economy.

The radiologist should properly be con-

* Presented at The Annual Congress on Medical Education, Medical Licensure and Hospitals, Hospital Departments of Radiology, February 19, 1930.

sidered as a consultant and all of his relations with the medical profession should be considered in the nature of consultations. The same ethical principles which apply to any other medical consultant should apply to him in his relationship with other physicians.

If it is not the opinion of the radiologist that the physician seeks when he sends a patient for examination but merely as *x*-ray photograph of a certain part, the radiological departments of hospitals may just as well be turned over to lay technicians.

If it is agreed that the radiologist is to be considered a consultant, then he should be given a position on the same footing as the rest of the staff in keeping with the dignity of his position, in order that he may retain their respect and secure their full cooperation. He should be actual director of his department, not director in name only. All department stationery should bear his name as director. He should have charge of all technical procedures and should be consulted in all matters of policy which govern his department. He should have a voice in determining fee schedule for all work done. He should be allowed a percentage of the receipts for the replacement of old equipment, commensurate with the size and income of the department, and should be the sole judge as to when such charges should be made. A certain amount of clinical investigation should be permitted and encouraged. He should, in turn, guarantee competent radiological service at all times, without cost to the hospital management. His compensation should be commensurate with the responsibility of his position and should equal that which he could reasonably expect from similar service in his own private laboratory. The hospital management is entitled to a percentage of the income from the department sufficient to compensate for rental of space occupied, light, heat, janitor service, interest on money invested in apparatus, etc., *but has no reasonable right to expect any profit* from the work done by the radiologist any more than it is entitled to a portion of the surgeon's, clinician's or any other physician's fees from patients attended in the hospital. One often hears it said that hospitals are not "paying institutions" and that as a result they are entitled to profits from the radiological and pathological work which originates in them to help maintain the institution. The fact that many hospitals operate without endowment or other means of support and still are able to show a profit would seem to indicate bad management of nonprofitable institutions. Likewise, even where an institution does not show a profit from its earnings, is this any reason why the radiologist should be singled out to help make up the deficit? Diverting a portion of the radiologist's fee to the general hospital fund is no doubt profitable for the hospital; I can conceive of an even more profitable arrangement by which the hospital would hire surgeons and clinicians on salaries and appropriate a portion of their fees.

The basis of compensation should be on the amount of work done; it matters little whether there is an adjustment salary (one which is changed by agreement from year to year on a basis of work done during the previous year) or on a percentage basis just as long as it represents a reasonable method of compensation for the work performed and *does not exploit the services of the radiologist*. An arbitrary fixed method of remuneration at once places the radiologist on the same basis with all other hospital employees, rendering it impossible for him to maintain the dignity of his position as consultant with the staff. Under these conditions he is bound to be considered more or less of a "glorified interne." No man can rise to his greatest possibilities when he does not feel that he is receiving adequate recognition or a fair return for his work. The percentage method for remuneration is by far the most satisfactory since it makes advancement of the department the common interest of

the institution and radiologist. Under this system the greater the amount of work done, the greater the radiologist's remuneration. This system is most flexible since as the work increases the amount of remuneration increases; the amount of time necessary to perform the work must necessarily increase also; after a time it may be necessary for the radiologist to engage an assistant, but in all circumstances the percentage will adjust the difference. If the institution is large, the amount of work done may be sufficient to justify the radiologist in devoting his entire time to the institution; if it is smaller, a part-time basis may be more satisfactory; in either event the percentage basis overcomes all difficulties. If the radiologist is on a full-time basis, he should be granted a contract for three to five years to assure him of the fruits of his labor after he has built up the department. If he is on a part-time basis and is also engaged in the private practice of radiology in his own office, then a hospital contract, although desirable, is not so essential.

Hospitals are institutions for the care and treatment of sick non-ambulatory patients and are supposed to be operated as an aid to the physician in his work. As such, the hospital radiology department should confine its activities to persons entered in the hospitals as patients who by reason of their infirmities are unable to consult a physician in his office or be treated in their homes. The recent tendency of some hospitals and other lay institutions to establish radiological laboratories for the examination and treatment of outside patients, employing a physician as radiologist on a salary, the institution collecting and retaining the fee, is a pernicious tendency which, if persisted in, most certainly will result in the ultimate exclusion of physicians from radiology as a specialty. If this procedure were carried out in all other departments it would place the practice of medicine in the hands of lay organizations and establish a form of contract practice which would stifle the progress of medicine for at least a generation. It is most important that institutions which profess to operate for the public good should not enter into open, and is some cases ruinous, competition with the laboratories of private radiologists. Operating as tax-free, charitable organizations, often exempt from liability, with relatively low overhead expenses owing to their locations in outlying districts, their ability to engage in collective purchasing and in advertising, their low cost of technical help, they are in a position to cut prices for radiological service to such an extent that no private radiologist can long maintain his position. They are subjects of charitable bequests and often operate under large endowments donated by wealthy individuals. This is almost the unanimous opinion of all radiologists consulted in the questionnaire; the dissenting members were all employees of large clinics. Definite instances are described in the answers to the questionnaires where hospitals operating *x*-ray laboratories for the service of outside patients have deliberately reduced the price of radiographic examination below cost, making up their deficits from the community fund, actually forcing local radiologists out of business. If only well meaning but misguided hospital boards could be made to see the throttling effect which such methods will ultimately have on the advancement of radiology as a science, they will see that in their zeal to provide the public with cheaper service, they are condemning them to inferior work. Yet I am advised that certain physicians, in some instances former officers of the American Medical Association, posing as hospital experts, propose the installation of this system to hospital managements whose institutions they are employed to survey.

What can be done to remedy these evils?

1. Choose as radiologist in charge of hospital radiology departments men whose clinical background and radiological experience measure up at least in some degree

with that of the staff members who will seek their services.

2. Establish the radiologist in full control of his department without intervention of hospital boards or staff members; permit him to make all charges and collect all fees. The fee schedule for the hospital should be the same as that prevailing in private laboratories of the community, so that if he is a full-time man, he will not enter into unjust competition with his fellow private radiologist; if he is a part-time man, he will not find that he is entering into competition with himself. It should be equally to his advantage to examine a patient in the hospital or in his private office.

3. Treat the radiologist as a medical consultant. The measures already recommended will go far towards maintaining him on this plane.

4. Assure him adequate and just return for his labor. Any attempt to divert a portion of his fee to the general hospital fund constitutes nothing short of fee splitting, if he is on a percentage basis; or contract practice, if he is on a fixed salary, and such a plan if applied to all other branches of medical practice will soon result in passing the control of medical science into the hands of lay organizations.

5. Hospital radiology departments should restrict their services to patients confined to the hospital, and should not solicit outside patients, thus establishing themselves in open unjust competition with the radiologist who maintains a private office.

I realize very well that it is impossible for anyone to prescribe the conditions under which a man shall or shall not work, and that it is mpractical for this committee to specify the attitude which shall be assumed by hospital boards towards their radiologists. I feel sure that these conditions which mar the relationship between the private radiologist and the hospital management have merely been introduced by misguided hospital boards, in an effort to reduce the cost of hospital care, without any due deliberation as to the ultimate effect which they will have on the science of radiology.

The following recommendations are submitted for the committee's consideration.

1. That, only well qualified trained radiologist should be placed in hospital department of radiology;

2. That, once appointed he should be given absolute control of his department;

3. That, he should be considered in all matters as a medical consultant;

4. That, he should be entitled to the fruits of his labor; that it is inadvisable and contrary to the principles of medical ethics for the hospital management to retain a portion of his fee;

5. That, the practice of hospital departments of radiology in entering into unfair competition with radiologists who maintain offices is unjust and should be discouraged as being detrimental to the progress of radiology.

DISCUSSION OF PAPERS BY DRS. CASE, BUTLER, ULLMANN AND SANTE*

M. J. HUBENY, M.D.

CHICAGO, ILLINOIS

THE subjects presented in this symposium were thoroughly covered and since evaluation is difficult, a discussion would be inexhaustible and chiefly philosophical in nature. However, it is apparent that the basic thought revolves around institutional activities for obvious reasons. Firstly, medicine has changed from an "eleemosynary" activity to a commercial enterprise, meaning that it is a method of gaining a livelihood in which there is an exchange of fair values. Naturally all values are ever-changing and require frequent readjustments. Secondly, because medicine is so comprehensive, specialization becomes necessary. Thirdly, instruments of precision are necessary, entailing a large investment and requiring cubic area for housing. To make a competent service purchasable for the average person, centralization and quantity production are necessary.

The hospital is undergoing a rapid change: the original purpose was to render therapeutic service, but now we have added to this a diagnostic service as well. This evolution is proper and will become more apparent and needful as time goes on.

Institutional medicine will be the final solution for the present chaotic and uneconomic situation. We must sense this situation and help solve it or lay people will do it for us. I firmly believe that physicians are well able to handle their own affairs.

It seems that we will have variants which will tend to adapt themselves to certain environments and localities. There will be three principal classes: (1) institutions supported by taxation, (2) institutions supported by private endowments, (3) those owned and directed by physicians or physicians and laymen.

Institutions will vary in the quality of performance. Large cities with tremendous wealth will be able to have keystone institutions, with the most approved housing and apparatus and a personnel of supermen; they will be able to render the finest service. Naturally, they will be the pace-makers, and as we are living in the most highly competitive era, the old axiom of survival of the fittest will still prevail for the best interests of all concerned.

Many abuses are practiced and, sadly, the roentgenologist, who has fitted himself, medically and specially, is not accorded the recognition that he merits and justly craves.

It is true that the *x*-ray apparatus is an instrument of precision and lends itself admirably to greater efficiency. Of course the novice knows little or nothing about its proper use. The general diagnostician pretends to know something about it and really, he becomes more efficient with the apparatus than without it. The specialist naturally becomes very proficient.

Many hospitals engage a radiologist for a low compensation and use his efforts as a source of revenue. This is hardly fair and the abuse is lamentable. However, it is rapidly becoming extinct because the fact is recognized that it is just as impossible to get a highly competent radiologist for little compensation as it would be to get a highly competent surgeon for little compensation. You can buy service, but you cannot buy brains. In other words, an inferior institution, with an inferior service, with inferior compensation, is going to handle the inferior individual of low mentality and low financial depletion.

We have a division of labor. We have the development of the technician. It has been mentioned that we are occasionally considered glorified technicians. I do not think we have to worry about that. Ultimately, the problem will solve itself, in a measure by continual conflicts or, better still, by courtesy and performance. But, we do not have to consider ourselves inferior because we have technicians.

In reality, the technician occupies the same relationship to the radiologist that the surgical nurse bears to the surgeon, or the obstetrical nurse bears to the obstetrician.

I am sure that we all know of instances in which certain obstetrical nurses would be

* Presented at The Annual Congress on Medical Education, Medical Licensure and Hospitals, Hospital Departments of Radiology, February 19, 1930.

better able to deliver a baby than some obstetricians, and quite a number of surgical nurses would be better able to do certain laparotomies than some surgeons. However, as a common practice it would not be condoned and rightly so. The pernicious practice of sending patients to lay persons for radiological service is reprehensible and subversive to the best interests of the patient, and should be discouraged and discontinued.

I think we have very many hopeful signs. I am not quite so despondent. Radiologists are getting a lot of recognition here and there. We were fortunate as medical men in getting a section in the American Medical Association which we all sought for many years, which immediately gave us medical recognition. As one looks over the list I have here, compiled by the American Medical Association (it is under the caption of Hospitals Approved for Residencies in Specialties), it is interesting to note that we have residencies in universities. I mean radiological residencies in universities, in municipal institutions, city, municipal, state and national in character, then we have the private hospitals such as the Metropolitan Insurance Company, various denominational hospitals and teaching schools and lastly, many private institutions, for instance, the Ford Hospital. All of these, if you look over this list, are high class institutions. I think from the very fact that they sense the situation properly, the final analysis will be made in conformity with the high ideals that radiologists have striven to attain.

REDUCTION OF SIMPLE FRACTURES OF THE EXTREMITIES UNDER LOCAL ANESTHESIA*

JACOB M. MORA, M.D., AND DAVID A. WILLIS, M.D.

CHICAGO, ILL.

THE occasion frequently arises when it is considered hazardous to administer a general anesthetic for the reduction of a simple fracture of an extremity. Several such conditions come readily to mind: senility, advanced cardiac and renal disease, hypertension, and pulmonary lesions. With the great increase in motor accidents, one not infrequently encounters concomitant fracture of the skull and one of the extremities, for the reduction of which general anesthesia is contraindicated. It is in such situations that local infiltration anesthesia is of value.

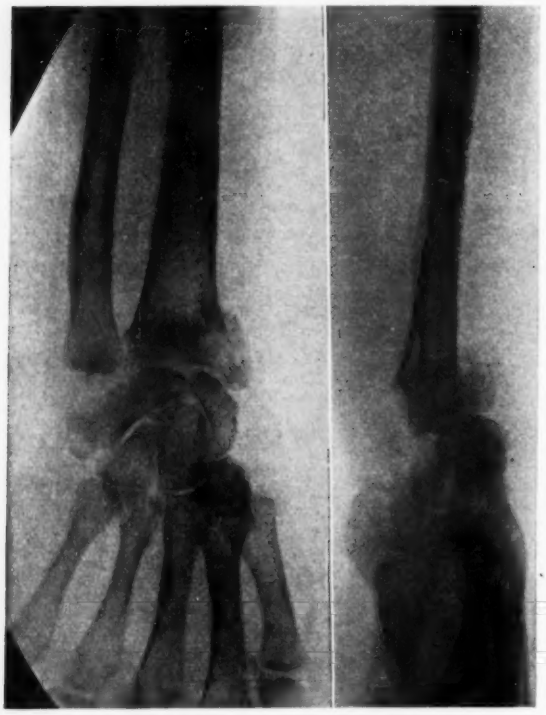


FIG. 1. Colles' fracture before reduction.

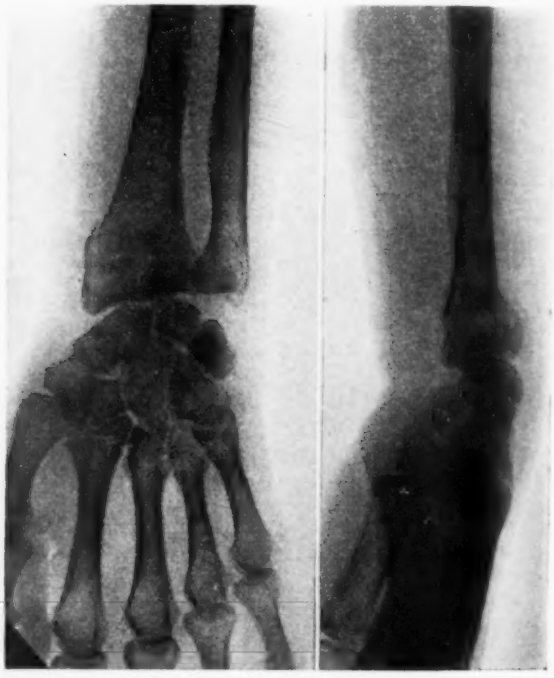


FIG. 2. Colles' fracture after reduction, using 5 c.c of 1 per cent novocaine solution.

It is a curious thing that a procedure which originated in America should have been developed to such a high degree abroad. It is a matter of record that the first report dealing with reduction of fractures of the extremities with local anesthesia was that by Conway[1] in 1885. He reported 3 cases of Colles' fracture and one of posterior dislocation of both bones at the elbow satisfactorily reduced under local anesthesia. Reclus[2] in 1903 made use of the method to transport in comfort a patient with a fractured femur, and found that thirty minutes later the anesthesia was sufficient to permit reduction of the fracture. Sporadic but significant reports subsequently appeared, indicating the value of the method (Lerda, Quenu, Dollinger, Braun, Cumston, Fulton, Hagenbach, Frostell, Cohen, Rice[1–12]). It is only within the past few years that the method has come to be used to any extent.

The advantages of local anesthesia are obvious. In addition to its value where general anesthesia is contraindicated, it may be advantageously used for other

* From the Surgical Service of Dr. H. M. Richter. Submitted for publication March 27, 1930.

purposes. For example, a fracture may be locally anesthetized and the patient then moved to the fluoroscopic room where

Fig. 3. Fracture of surgical neck of humerus before reduction.

reduction may be accomplished leisurely and without the danger associated with the use of inhalation anesthetics. Again,

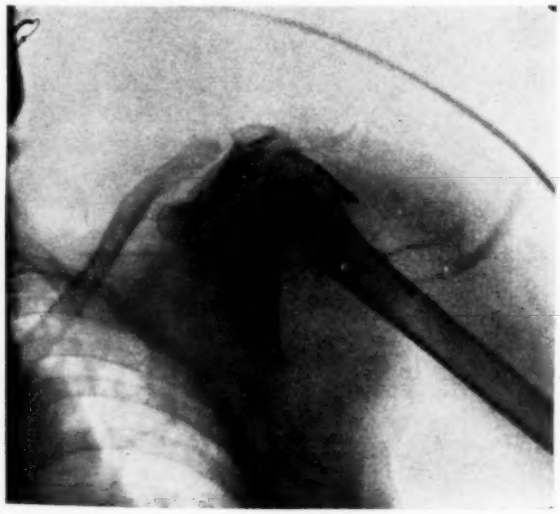


Fig. 4. Fracture of surgical neck of humerus after reduction, using 15 c.c. of 1 per cent novocaine solution.

should the reduction not be satisfactory, the extremity may subsequently be remanipulated with local anesthesia until proper reduction is accomplished.

The contraindications to its use are compound fractures, infected or traumatized skin, and infection elsewhere in the extremity.

Theoretically, there exists the danger of introducing infection from without. Practically, however, this is a negligible factor.

Fig. 5. Fracture of femoral neck before reduction.

No cases have been recorded where infection followed local infiltration anesthesia, and with scrupulous care it may be avoided.

The method consists of the injection of the local anesthetic directly into the site of

Fig. 6. Fracture of femoral neck after reduction, using 15 c.c. of 1 per cent novocaine solution.

fracture. We have been using a 1 per cent solution of novocaine with adrenalin (1 minim to the ounce). Under sterile pre-

cautions, a small wheal is made in the skin, and with another longer needle the solution is injected between and around the fragments. One knows when the fractured area is reached by observing the washed out, faded blood that wells up in the syringe and which is readily distinguished from the blood that is drawn up in the syringe if a blood vessel is punctured. Five to 60 or 70 c.c. may be injected depending on the type of fracture and the size and condition of the patient. We have found small amounts quite satisfactory. Anesthesia is usually complete in from ten to thirty minutes. It is astonishing to see the remarkable change produced by the local anesthesia: patients who a short time before would not even allow one to touch the affected extremity soon permit every kind of manipulation, without uttering a sound.

The following cases are illustrative:

Case I. Mrs. F. L., aged seventy-five, was admitted to the hospital with a fracture of the surgical neck of the left humerus. Satisfactory and painless reduction was accomplished with 15 c.c. of novocaine (1 per cent).

Case II. Mrs. H. K. aged ninety-three, was admitted with a fracture of the surgical neck of the left humerus. In this case also, the injection of 15 c.c. of solution sufficed to permit manipulation and reduction of the fracture.

Case III. Mrs. S., aged sixty-three, a diabetic with a systolic blood pressure over 200 sustained a fracture of the surgical neck of the left humerus. Reduction was easily accomplished after the injection of 15 c.c. of novocaine.

Case IV. Mrs. I. G., aged fifty-eight, sustained an intertrochanteric fracture of the left femur. An almost perfect reduction followed the injection of 15 c.c. of novocaine.

Case V. Mrs. A. S., aged fifty, was admitted with a Colles' fracture (left). The fragments were satisfactorily apposed after the injection of 5 c.c. of solution.

Case VI. Mrs. L., aged sixty-five, sustained a right Colles' fracture, which was satisfactorily reduced with 5 c.c. of novocaine.

SUMMARY

Attention is directed to the value of local infiltration anesthesia, as a simple, safe, practical procedure in the reduction of simple fractures of the extremities.

REFERENCES

1. Conway, J. R., Jr. Cocaine as an anesthetic in fractures and dislocations. *N. Y. M. J.*, 42: 632, 1885.
2. Reclus. L'Anestesie localiseé par la cocaine. Paris, Masson & Cie., 1903, 266.
3. Lerda, G. Die fraktische Anwendung der lokal Anästhesie bei Frakturen. *Zentralbl. f. Chir.*, 34: 1417, 1907.
4. Quenu. De L'anesthesie locale par la cocaine dans la reduction des fractures. *Bull. et mem. Soc. de chir. de Paris*, 34: 976, 1908.
5. Dollinger, B. Ueber die Reposition der Bruchenden in Lokalanästhesie. *Zentralbl. f. Chir.*, 40: 763, 1913.
6. Braun, H. Die Anwendung der Lokal-anästhesie z. Reposition subkutaner Frakturen u. Luxationen. *Deutsche med. Wchnschr.*, 39: 17, 1913.
7. Cumston, C. G. *Internat. Clin.*, 4: 213, 1918.
8. Fulton, R. A. H. Local anesthesia in the reduction of fractures. *Brit. M. J.*, 2: 796, 1921.
9. Hagenbach, E. Die Anwendung der Lokalanästhesie bei der Behandlung der Extremitätenfrakturen. *Schweiz. med. Wchnschr.*, 51: 488, 1921.
10. Frostell, G. Lokalanästhesie und Frakturbehandlung. *Zentralbl. f. Chir.*, 52: 1308, 1925.
11. Cohen, I. Local anesthesia in the reduction of fractures. *J.A.M.A.*, 86: 1896, 1926.
12. Rice, C. O. Local anesthesia in the reduction of fractures of the lower forearm. *J.A.M.A.*, 90: 1768, 1928.

Local anesthesia in fractures. *Journal-Lancet*, 49: 134, 1929.

HERNIA OF THE SMALL INTESTINES

INTO THE LESSER PERITONEAL CAVITY

REPORT OF A CASE*

BYRON H. JACKSON, M.D.

SCRANTON, PA.

AT necropsy and at operation the small bowels have occasionally been found in the lesser peritoneal cavity, having slipped through the foramen of Winslow. This statement may be verified by turning to the anatomy of the peritoneal cavities, in which the foramen of Winslow is described. The great rarity of this hernia is due to the protected position of the foramen and the overlying liver. Pfanner[1] and Stauning in 1921 made a correct roentgenological diagnosis of this condition. Lombard[1] in 1923 reported 29 cases, in 11 of which there were digestive disturbances of varying degrees. Case and Upson,[1] in 1926, gave the roentgenological aspects of various types of internal hernias, among which was that of the small bowel into the lesser peritoneal cavity. Since hearing this latter paper, the author of this report has been on the lookout for these various conditions, and his vigilance has been rewarded by finding, during a routine hospital examination, the following case of hernia of the small bowel into the lesser peritoneal cavity.

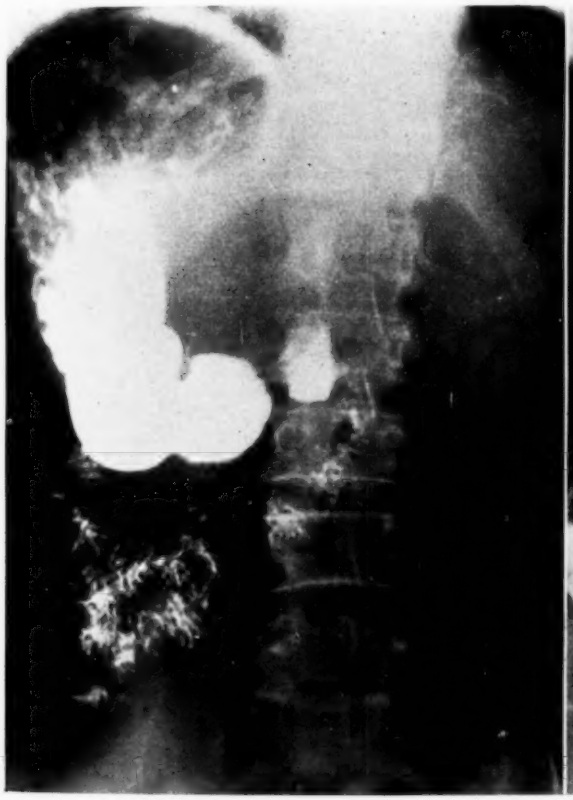


FIG. 1. Shows stomach ten minutes after opaque meal. Notice at this time small bowel is shown only on left side.

FIG. 2. Three hours after ingestion, stomach nearly empty. All small bowels are on left side.

[1] Quoted from CASE and UPSON, *J. A. M. A.*, 87: 891–897, 1926.

* Submitted for publication April 18, 1930.

CASE REPORT

A. W. B., a well developed, healthy appearing male, age forty-eight, 5 ft. 7 in. in height; occupation, insurance salesman. Chief complaint indigestion, with intermittent pain in the upper abdomen. Has been having frequent attacks of pain in the upper abdomen over a period of fifteen or twenty years. Pain is sharp at times, of a colicky character; at other times it is simply a distressed feeling. Pain comes on one to two hours after meals, and at night between twelve and one o'clock. Heartburn at times. Relief has been obtained by flexing right leg on abdomen and bending over. Hot water and soda sometimes give relief. Laxative occasionally relieves. Pain aggravated by indiscretions of diet, acid foods, etc. Short periods of complete relief were experienced, and then long periods of distress. Vomiting an occasional symptom. No blood in vomitus or stools; no loss of weight. Palpation of the abdomen elicits slight tenderness in the epigastrium. No rigidity.

X-ray Findings: Stomach and duodenal bulb apparently normal. There is hyperperistalsis. Figure 1 shows the stomach ten minutes after opaque meal. Notice at this time the small bowel is shown only on the left side. Figure 2, three hours after ingestion, shows the stomach nearly empty. All the small bowels are on the left side. Figure 3, four hours after ingestion, shows a slight residue remaining in the stomach, with the small bowel still on left. Note the slight dilatation of the small bowel. Figure 4, five-hour film, shows the same condition. In Figure 5, the six-hour film, note the opaque material in the small bowel reaching up to pass through the foramen. Figure 6, seven-hour film, shows the small bowel partially within and partially without the lesser peritoneal cavity. Note the angulation of the ileum as it passes through the foramen. In this roentgenogram the cecum is already filling.

At operation the small bowel was found in the larger peritoneal cavity. The foramen of Winslow admitted three fingers. The foramen

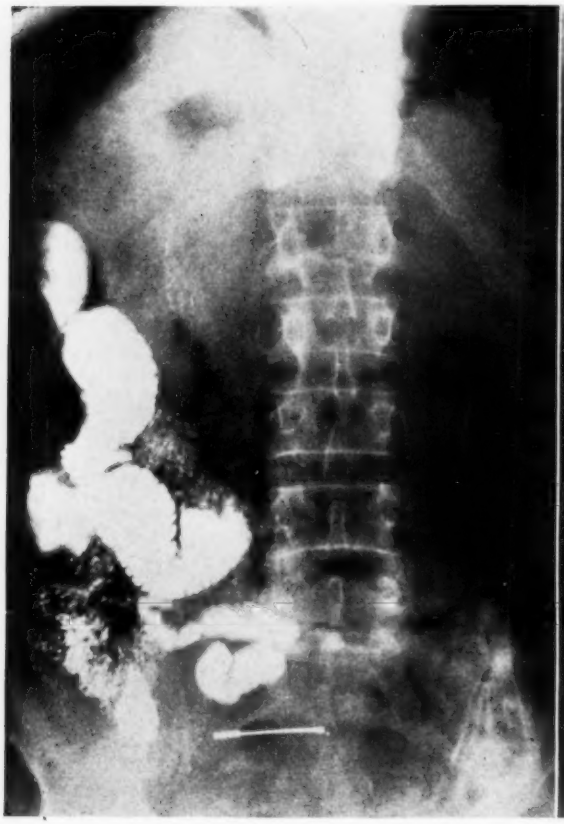


FIG. 3. Four hours after ingestion, slight residue in stomach, small bowel still on left. Note slight dilatation of small bowel.

FIG. 4. Five-hour film, same condition.

was closed by suturing the layers of the peritoneum. One year after operation, roentgenograms of the stomach and small bowel were normal and there was no evidence of displaced small intestines. The patient has been perfectly well for two and one-half years, and has had no recurrence of symptoms.

The author is indebted to Dr. Carl Hosier for the history of this case and for permission to report it.

Fig. 5. Six-hour film. Note the opaque material in the small bowel reaching up to pass through foramen.

Fig. 6. Seven-hour film. Small bowel partially within and partially without the lesser peritoneal cavity. Note angulation of ileum as it passes through foramen. In this picture cecum is already filling.

CASE REPORTS

CARCINOMA OF THE BLADDER

URETEROSIGMOIDAL IMPLANTATION, TOTAL CYSTECTOMY*

PAUL W. ASCHNER, M.D.

NEW YORK

THE SUBJECT of this presentation is a man sixty-two years old who was referred for frequency, dysuria and hematuria by his family physician on January 25, 1929. The symptoms were of three months duration and had grown progressively worse so that he was now voiding every half to one hour by day, and every twenty to thirty minutes by night. The urine was grossly bloody and contained much pus; residual, two ounces. Per rectum the prostate was symmetrically enlarged to three times the normal size. Roentgen examination of the genitourinary field showed a few phleboliths, no calculi and no evidence of metastatic lesions of the lumbar spine or pelvic bones.

Cystoscopic examination disclosed intraurethral enlargement of the lateral lobes of the prostate. On the anterior wall of the bladder extending downward to the vesical neck and laterally along the left lateral wall to the left ureteral orifice was a papillary partly necrotic growth evidently malignant in nature. Specimens removed for histological study proved it to be a papillary carcinoma with a tendency to squamous metaplasia.

In view of the extent of the lesion, its location and nature, total cystectomy with removal of the prostate and seminal vesicles was advised. Having observed the miserable existence of patients upon whom this procedure had been carried out in one step, the ureters being brought out on the abdominal wall and tubes carried in them for the rest of the patient's invalided existence, it was deemed preferable to precede the cystectomy by the simultaneous implantation of both ureters into the sigmoid as devised by Coffey. Since the patient was spare of build, he seemed a particularly favorable subject for this procedure.

The man refused operation at this time and it was not until August 19, 1929 that he agreed to undergo it and entered the hospital. The blood urea was 18 mg. per 100 c.c. On August 23 the intestinal tract having been prepared by catharsis and enemata, the first step was carried out. As I found it impossible to pass a sigmoidoscope more than 15 cm. the introduction of a packing into the sigmoid had to be dispensed with. Spinal anesthesia, 0.12 neocaine, was employed, supplemented later by gas oxygen and ether. A liberal median infraumbilical laparotomy was performed. The ureters were exposed by incising the posterior parietal peritoneum over them. They were both dilated, measuring fully a centimeter in diameter, thin-walled and tortuous. After being traced downward almost to their vesical insertion, they were divided as low down as possible, the vesical ends being ligated with chromic catgut. The upper ends were slit for about 2 cm. and No. 12 catheters introduced toward the kidneys for a distance of about 12 cm. At this point the slit ureters were secured to small rubber cuffs with which the catheters were armed. The typical submucosal implantation described by Coffey was now carried out. The free ends of the catheters were pushed downward through a small mucosal incision until an assistant could withdraw them from the rectum. Traction was then exerted upon the catheters until the rubber cuffs had passed into the lumen of the bowel. The ureters were then buried in the sigmoidal wall by the necessary chromic catgut sutures to approximate the incised serous, muscular and submucosal coats. A Lembert linen stitch then completed the anastomosis.

The ureteral beds were then closed with fine catgut and as the bowel was approached the sites of implantation were carefully extraperitonealized. The abdomen was closed in layers without drainage. A slight technical error was

* From the Urological Service of the Brownsville and East New York Hospital. Read before Section of Genito-Urinary Surgery, N. Y. Academy of Medicine, October 16, 1929.

made in that the right ureter was implanted lower down than the left; but this did not inconvenience me to any extent.

The postoperative course of the patient was characterized for five days by extreme abdominal distention for which at first we could employ only turpentine stupes. On the seventh day calomel and a saline produced good evacuation and complete relief. The ureteral catheters drained copiously and without interruption. The specimens showed from the very first some leucocytes on both sides.

To prevent incrustation, daily instillation with acriflavine was employed. On the tenth day the catheters came away spontaneously; very small sloughs were adherent to the rubber cuffs. I present the catheters for your inspection. On the tenth day the temperature rose to 101° and there was considerable suprapubic pain and tenderness. A catheter introduced into the bladder yielded four ounces of thick foul pus and blood. Thereafter the bladder was emptied and irrigated daily until clear. This procedure eliminated the fever and local symptoms. On the twelfth day, the wound having healed by primary union, the patient was allowed out of bed. He had complete control of the rectum, emptying it of urine and feces five or six times a day.

On September 9, 1929, seventeen days after the first step, the cystectomy was performed. The bladder was thoroughly irrigated and emptied. Spinal anesthesia was again administered. The original incision was reopened down to the bladder and peritoneum. The rectus muscles were partly cut across near the symphysis to permit of better exposure. With considerable difficulty a plane of cleavage was found between the bladder and the peritoneum laterally. When we attempted to isolate and free the fundus, the peritoneal cavity was entered and the sigmoid flexure was found adherent to the peritoneum covering the posterior wall of the bladder. By careful sharp and blunt dissection the separation of the peritoneum from the bladder was accomplished down to the region of the prostate and vesicles. The bladder was now mobilized by dividing the lateral ligaments between clamps as far out as possible. The vasa deferentia were ligated and divided and the seminal vesicles exposed. The fascia of Denonvillers was incised and the prostate freed bluntly, posteriorly and laterally. By dividing the puboprostatic ligaments, I freed the entire mass to be removed, except for its attachment to the membranous urethra. This attachment was severed with a curved scissors and the specimen removed in

Fig. 1. Bladder, prostate and seminal vesicles removed as a unit. Specimen opened along midline anteriorly. Large papillary carcinoma infiltrating muscularis, involving trigone and vesicle neck. Hypertrophied bladder due to obstruction of the latter.

one piece—bladder, prostate and seminal vesicles. Considerable venous bleeding occurred from the divided urethra but was controlled by packing and the pressure of a Deaver retractor. After applying hemostatic sutures, we removed the clamps on the lateral ligaments.

The peritoneal rent was now carefully repaired. The huge cavity left by the radical resection was drained with a Mickulicz tampon of rubber dam and gauze. This was lead out above the symphysis and the rest of the wound closed. A rectal tube was inserted.

The patient's convalescence was remarkably smooth. There was not the least interruption in the renal function, the bowel emptying itself at first through the rectal tube, then naturally. On the fourth day the packings were removed and a tube inserted. There was a profuse discharge of thin purulent foul fluid which strongly suggested urinary leakage. Methylene blue given by mouth appeared in both the drainage and the rectal discharges. The urea content of fluid from the wound was

0.6 per cent. Indigo-carmine administered intravenously subsequently failed to appear in it, although promptly appearing from the rectum. With discharge of several sloughs the drainage from the wound became much less. It is possible that a pin point opening in the rectum was made in dissecting out the prostate. No fecal matter ever came through it and the urea content may have been due to the pus alone. There is still some thin serous odorless discharge; but I attribute this to the large raw surfaces which still remain unobliterated.

The specimen consists of the bladder, prostate and seminal vesicles removed as a unit. It has been opened in the mid-line anteriorly. (Fig. 1.) The bladder wall is markedly hypertrophied. A large sessile papillary growth involves the left ureteral orifice, the paratrigonal region, the left lateral wall and the anterior wall of the bladder. Only the right half of the trigone is free. Superiorly, the growth extends about halfway to the apex of the bladder on the left side. Inferiorly, it extends well down to the bladder neck. On section the growth is found to be a papillary carcinoma with tendency to squamous metaplasia. It shows invasion of the bladder wall.

DISCUSSION

Dr. B. S. Barringer: I have never been able to admire this operation but I cannot but admire Dr. Aschner's admirable performance of it. It is a beautiful technic, and that is what lures us on; and when you do what he has done you have accomplished a beautiful technic. There is no need of my going further, but I believe it will never be a popular operation; the mortality is high. I believe about 50 per cent.

I would like to ask Dr. Aschner how much induration of the bladder there was. Of course when we saw the picture it had infiltrated the bladder wall; but that was not a great deal. It struck me that the case might have been treated with radium with just as much chance of cure and with a 3 or 4 per cent mortality.

Dr. Coffey, when I was in Boston, radiated the tumors very severely, and before the ultimate effect of the radiation was attained, i.e. in four to six weeks, he took the tumor out. That was a very interesting way to do. He evidently had opened the bladder and radiated the tumors.

Dr. Aschner, *closing:* Dr. Barringer says the mortality of this operation is about 50 per cent; but that is based on statistics of ureteral implantation going back for many years when the technic was not the same. Catheters were not used and rarely were both ureters transplanted at one time. In 1923, Fedoroff of Petrograd, however, reported five cases of bilateral transplantation only one of which was lost. Of the four in which the cystectomy was carried out, one remained well without recurrence six years after operation. Lower reported two successful cases in which the ureters were transplanted separately, the cystectomy being performed as the third step.

The risk of mortality in the two-stage radical operation is not from the cystectomy, but from the ureteral transplantation. Under modern conditions and technic, I believe this mortality is between 10 and 15 per cent. The mortality of the one-stage operation of cystectomy bringing the ureters out upon the skin, is at least equally high. The incidence, moreover, of pyelonephritis, calculus, stricture of the ureter, etc., after such operation, together with the discomforts and the amount of care necessary, make preferable the procedure used in the patient presented tonight.

I have employed all the means, both surgical methods and physical agents, in vogue, for the treatment of malignant vesical tumors; but this man has had a smoother, more comfortable convalescence than those upon whom the less radical procedures have been practiced. While nothing may be said as to the permanence of the result, I feel that certain types of bladder carcinoma can be treated rationally only this way.

FOREIGN BODIES IN OS CALCIS*

G. H. V. HUNTER, M.D., F.A.C.S.

BROOKLYN, N. Y.

FROM time to time we read in the lay press of the migration of a foreign body, such as a needle, throughout the human body. This is a report of a case of a piece of nail piercing the os calcis in childhood, becoming firmly surrounded by solid bone and giving no symptoms for twelve years.

CASE HISTORY

While romping on the beach, a child, twelve years old, cut his foot. It bled a little and the foot was examined by a doctor, who said it was a small punctured wound. He treated it aseptically and the wound healed in a few days. The boy thought no more about it until years later when he commenced to have a dull aching pain in the heel. He sought medical advice and the roentgen ray as here shown revealed the cause of the trouble.

Examination showed a well-developed man of twenty-four years. No evidence of injury was found on the foot and tenderness was elicited on pressure. I advised an operation for removal of the foreign body and he was admitted to the hospital.

Operation: I was somewhat at a loss as to the method of approach as there seemed to be at least a half inch of solid bone covering the nail and I did not like the idea of ruthlessly chiselling away bone to reach it. I solved the difficulty by using a trephine and took out a plug of bone from the outer side of the os calcis, at the site of the nail shadow in the roentgen ray. At the depth of ¾ inch I struck the nail. I removed the plug of bone, placing it in warm saline. I then, with considerable difficulty, extricated the piece of nail through the trephine opening and curetted away a little rusty bone. There was no sign of any infection and I irrigated the cavity with saline and replaced the plug of bone which healed perfectly. The result of the operation was a happy one. The patient left the hospital in a few days, walked in a slipper in two weeks and resumed his work in one month. The foreign body proved to be a piece of nail with the head and point broken off. It measured ⅞ in. long, ⅛ in. wide, and 1/16 inch thick.

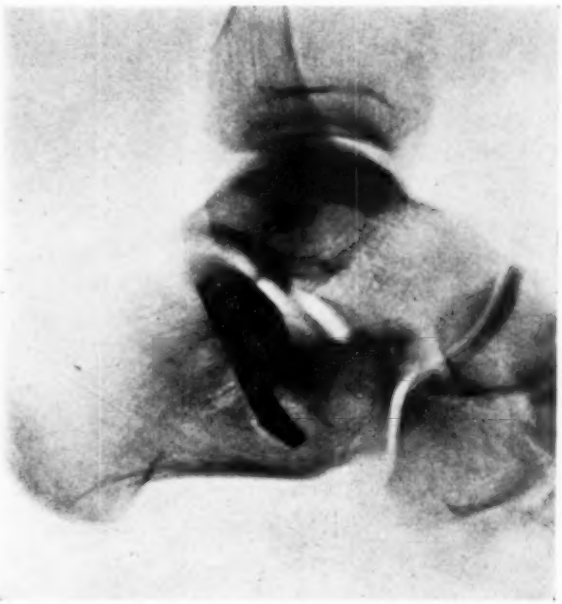


FIG. 1. Lateral view of foot showing foreign body within os calcis completely surrounded by solid bone.

* Submitted for publication October 17, 1929.

RESECTION & ANASTOMOSIS OF THE IMPERVIOUS URETHRA*

WILLIAM NEILL, JR., M.D.

BALTIMORE, MD.

IN MY clinic at the Cambridge-Maryland Hospital I am constantly called upon to solve the many and varied problems in general surgery. Prompted by Dr. H. H. Young's article,[1] on the treatment of complete rupture of the posterior arethra, I submit a complete report of three patients with lesions in the bulbous urethra anterior to the triangular ligament, two of complete rupture from a fall astride some object, one recent, and the other four and one-half months old and after previous operation. The third, similarly located and impermeable, was the sequel to an old gonorrheal infection and resistant to previous attempts at dilatation.

The lesions found in rupture of the urethra vary from slight lacerations all the way to a complete division, complicated at times with an extensive fracture of the pelvis with urinary or fecal extravasation. Extreme cases are seen following crushing injuries rather than a fall as in two of my patients. In view of the importance of the departure from the routine methods, I shall report them separately and in detail.

CASE 1. White, aged thirty-eight, married; occupation, railroad fireman, on May 4, 1926 slipped into the water tank of his tender and fell several feet on to a submerged pipe, sustaining a severe and painful perineal injury with immediate severe pain, inability to void and bleeding from the urethra. Seen two hours later; excellent general condition, hemoglobin was 80 per cent, abdomen negative, the external genitalia not affected but a distinct bulging in the perineum. Per rectum a normal prostate was felt and definite compression of the rectum by a soft mass extending up to the base of the bladder. A catheter passed into the urethra reached the region of the membranous urethra and evacuated a moderate amount of blood; a finger in the rectum detected the catheter free in a cavity in front.

Diagnosis: complete rupture of the urethra with extravasation of blood. An *x*-ray examination of the pelvis disclosed a transverse fracture of the right descending pubic ramus in situ.

Operation: A longitudinal incision in the perineum opened into a large hematoma; when this was evacuated an actively spurting artery was seen. This and all lesser bleeding points were controlled by plain catgut ligature. Investigation with a sound per urethrum revealed the bulbous urethra completely severed just in front of the membranous urethra and the triangular ligament. The posterior end could not be located in the bruised and bloody field and, as I did not feel a suprapubic retrograde catheterization advisable at the time, the skin was united loosely with catgut around a gauze drain. When the patient recovered from the anesthetic, voiding was normal through the perineal wound, no urine passing from the meatus; this continued until June 9, 1926, when healing was complete except up to a small urinary sinus. On this date the second operation was done to anastomose the severed urethra. A rubber catheter was passed into the bladder through the perineal sinus and the healed incision reopened and a metal sound passed through the meatus which reached to within 2½ cm. from the posterior urethral opening. The completely closed anterior end was opened on the tip of a sound and freed with sufficient paraurethral tissue to assure circulation and thoroughly mobilized. The posterior segment was likewise mobilized. A No. 24 F. soft rubber catheter was introduced anteriorly to the perineal opening, when the original catheter was removed, and passed on into the bladder. Around the catheter a transverse end-to-end anastomosis was done with interrupted No. 0 twenty-day catgut sutures. Additional sutures of plain fine catgut were placed through the fibrinous and muscle tissue to reinforce the

[1] Young, H. H. *Trans. Am. Assoc. G.-U. Surg.*, 21: 1928.

* From the Howard A. Kelly Hospital. Submitted for publication December 3, 1929.

first line of closure. A small gauze drain was placed to the line of anastomosis, and the closure completed with plain catgut. The convalescence was normal; the catheter, remaining in place without any leakage, was removed on the tenth day. Voiding was normal and in two weeks the incision was healed. The fracture gave no trouble. Dilatations were carried out June 23, July 2 and 9, September 16, December 1 and January 24, 1927. July, 1927, sounds revealed no stricture and erections were normal. He has remained free from any sequelae.

Case II. White, aged sixty, married. Occupation: carpenter. While working September 1, 1926 fell astride a saw horse and sustained a severe blow on the perineum. An operation done the same day for a ruptured urethra through a suprapubic and an inverted U incision in the perineum was unsuccessful, and the urine drained suprapubically and through two perineal fistulae. Perineal abscesses developed from time to time, either rupturing spontaneously, or calling for an incision. There was always a discharge of pus demanding a pad. For a short time a small amount of urine passed the meatus, but none for two months up to the time I first saw him on January 19, 1927, when he came through the advice of the first patient. Examination negative, outside the local condition. The healed suprapubic scar drained a little urine through its lower angle. There were two small discharging sinuses in the perineum. He voided urine through both voluntarily, and the entire region was densely scarred. External genitalia were normal, prostate was diffusely hypertrophied, without symptoms. Rectal examination otherwise negative. Filiform bougies introduced into the perineal sinuses failed to enter the bladder and a sound passed through the meatus only reached the membranous urethra, the tip just being palpable per rectum through the dense scar tissue.

Diagnosis: complete traumatic rupture of the bulbous urethra with marked cicatrix and water-pot perineum.

Operation on date of examination under ether anesthesia. The anterior urethra and both perineal sinuses were injected with methylene blue. A metal sound was passed through the anterior urethra to the point of obstruction and a second through the suprapubic fistula into the bladder out through the prostatic urethra, the tip extending through the membranous urethra. A median incision was made in the perineum and both sinuses dissected out under the guidance of the methylene blue, as they led by separate tracks to the tip of the sound in the membranous urethra just outside of the triangular ligament. A large amount of scar tissue was dissected away, clearly exposing both sounds and completely destroying a gap of 3 cm. of the urethra. The severed ends were freely mobilized and all fibrous thickening removed out into the normal surroundings. A No. 24 F. soft rubber catheter was passed into the bladder through the posterior segment as the sound was removed and the distal end threaded on to the tip of the anterior sound and withdrawn out through the anterior urethra. An end-to-end transverse anastomosis was done around the catheter with interrupted No. 1 twenty-day catgut sutures, reinforced by additional sutures of plain catgut. The skin was loosely united with black silk and a plain gauze drain left inserted at the posterior angle. Convalescence normal, healing without leakage or extravasation. The suprapubic incision healed spontaneously. The catheter was removed on the twelfth day and sounds to No. 20 F. passed on the fourteenth day. When the patient was seen in two months voiding was normal and I was able to dilate to a No. 28 F. He was well in July, 1927 when sounds were passed; a further recent report states that he is well.

Case III. Differing from the preceding was the case of a patient with an impermeable stricture from an old gonorrheal infection. As the operative procedure was somewhat similar, I include it here. The patient, white, aged fifty-one, married, was by occupation a water-man. As a youth he contracted gonorrhea, and for twenty years had attacks of dysuria lasting several weeks; at no time was he able to void normally. This gradually increased and no prolonged relief was experienced from dilatations. In March, 1929 an operation was done for hemorrhoids and the stricture unsuccessfully dilated and since then, particularly for the past three weeks, has been in constant pain, emptying the bladder most of the past week involuntarily by dribbling. Attempts to catheterize have failed. I first saw him September 12, 1929, in great pain,

with the bladder extending halfway to the umbilicus with an involuntary dribbling of ammoniacal urine. A sound refused to go beyond the region of the triangular ligament; the obstruction was also impermeable to filiform bougies. The prostate was normal and above it lay the tense, distended bladder. Rather than do a cystostomy I decided to resect the stricture from below. Methylene blue was injected anteriorly and milked towards the bladder. A median perineal incision was made and the tissues cut down to a sound passed to the obstruction. The urethra was dissected free over the sound and opened on its tip. It was markedly thickened and the lumen tortuous and threadlike, a fact clearly demonstrated by the methylene blue. The stained tract was followed up to the normal urethra just in front of the triangular ligament. The entire segment of the urethra (2.5 cm.) was excised with all enveloping scar tissues. A No. 22 F. soft rubber catheter was then introduced into the bladder, evacuating 1200 c.c. of foul urine. The distal end of the catheter was then threaded over the tip of the sound and drawn out through the meatus. With moderate tension the ends were joined transversely about the catheter with interrupted No. 1 twenty-day catgut sutures, reinforced by plain catgut sutures, and the skin closed with interrupted sutures, leaving a small cigarette drain up to the anastomosis. Convalescence normal; no leakage or extravasation of urine until the catheter was removed on the seventh day as the patient began voiding around it, with some leakage through the perineum. Voiding continued normal and the perineal leakage grew less and ceased at the end of the fourth week when the healing was complete. At the end of the second week I passed a small sound into the bladder. A No. 28 F. easily passed in the fifth week and voiding was normal. He was seen and dilated October 30th; subsequent dilatations will be continued.

Case IV. A fourth patient was operated upon at the Church Home and Infirmary, Baltimore, in 1915. Since a portion of the history is lost, a detailed report cannot be given. An employee of a timber company in North Carolina fell while at work, straddling an object and sustained a severe blow on the perineum, followed by bleeding from the urethra. He remained in a local hospital for three weeks with a retention catheter; following its removal he found voiding difficult at first, gradually growing worse. Attempts to dilate gave no definite relief. When I saw him approximately six months after the injury, I found the bulbous urethra markedly indurated, and a sound stopped at this point. After consultation with the late Dr. J. T. Geraghty, instead of an internal urethrotomy, an open operation was carried out as described in Case III; this was followed by complete relief. Subsequent dilatations were carried out, the patient remaining perfectly well until I lost track of him five years later.

CONCLUSIONS

1. Accurate knowledge of the regional anatomy is a prime requisite.

2. Preliminary injection of methylene blue is of great assistance, outlining the distorted urethra and any diverticula for the subsequent operation.

3. Sharp dissection, delicate instruments and fine sutures with careful manipulation insure the union of the approximated tissues.

4. Some follow-up dilatations of the urethra must be carried out later to obviate any stricture in the tract.

INFLAMMATORY CARCINOMA OF THE BREAST*

CHARLES M. FOX, M.D.

SAN DIEGO, CALIF.

I AM reporting these cases as, contrary to some statistics, this lesion seems to be a rather unusual one. Besides, they were seen earlier than most reported cases, which is an important factor as we must make earlier diagnoses in this group if we are to have even an early mortality of less than one 100 per cent. The cancer mortality from breast carcinomas is already very high but these cases are practically always rapidly fatal. The first patient presented a lesion which was only moderately advanced for this type but died within a few months. The next patient, a little more advanced, disappeared after I had examined her and the third case is still living but the condition is only a few months old. (Since writing this report, the third case has died of local, cerebral and massive lung metastases, six months after operation.)

CASE I. Mrs. T; English by birth; thirty-nine years old. Married for twelve years; had three children, eleven, five and three. She was stout and well-nourished which condition persisted until a very short time before her death. She was sent to me for examination of the left breast. Stated that a few weeks before she noticed that the left breast was thickened and she thought it was slightly enlarged. She felt no pain but rather a sort of burning sensation. She consulted a doctor a few days previous to my examination for the first time. Stated she nursed her first child but was unable to nurse the others.

Examination showed a rather stout woman, 5 ft. 5 in. tall; weight 180 pounds. The general physical examination showed nothing abnormal. Breasts were pendulous and large. There was a thickening of the left breast; the skin was a little edematous and pinkish, not a marked redness. There was a diffuse thickening of the whole breast tissue and a slight tenderness. The nipple was normal in appearance, but on squeezing, I found a slight serous discharge. The temperature was 99.6°F.; pulse 84. There was no history of chills nor acute onset. From the appearance of the breast, I believed this was a mild inflammatory condition aggravated by the pendulous condition. I ordered elevation, rest in bed and hot moist applications.

One week later she reported and was much improved. The tenderness was nearly gone; the edema not so marked and the pink color almost absent. I ordered a continuation of the same treatment. At the end of another week she returned feeling less comfortable, but as she had only partially carried out my orders, I told her to continue as she had been doing: that is, elevation, heat and bed rest.

I saw her again in a few days in which time the pain and tenderness had increased and the redness and edema were more marked. I sent her to the hospital with the idea of opening a deep abscess. On cutting into the mass I found what appeared to be a definite malignancy. Therefore had sections made and did a radical removal. Enlargement of a few axillary glands was beginning. The immediate convalescence was normal; but three months later signs of lung involvement appeared and in a few weeks she was dead, of extensive metastases both local and general.

CASE II. This patient presented herself for examination a few weeks after the first one. She was forty-one years old; unmarried, rather stout and had large pendulous breasts. The history was of a thickening noticed some few weeks before and of discomfort, pain and burning for the past few weeks. The right breast was involved.

Examination showed a large, pendulous, right breast with considerable thickening. The skin was pink and slightly edematous. No retraction of the nipple and no palpable glandular enlargement. I advised deep *x*-ray therapy, but did not see this patient again. She had very definitely the same type of growth we found in the first instance.

CASE III. This patient came in for examination about four months ago. A large woman; fifty years old, married, but had borne

* Read before the Pacific Coast Surgical Association, Santa Barbara, Calif., February 22–23, 1929.

no children. She first noticed thickening of the left breast two months previous. There was slight pain, burning and tenderness for only a few days. The breast appeared slightly enlarged and there was an indefinite tumor mass. The skin was slightly edematous and slightly pinkish but was not reddened. This was localized to an area 2 in. in diameter around the nipple. There was no palpable glandular enlargement. The breast was quite sensitive to the touch. This, as in the other cases, looked like a mild inflammatory process, but in the absence of history suggesting an infection, I advised a radical removal. I did this believing that this was an inflammatory carcinoma but I thought it possible that being a relatively early case, operation might offer something. I knew also that nothing else offered any relief.

She did not come in for operation till two weeks later, at which time the edema was very, very much less and had almost disappeared, the mass, however, remaining the same. I did a radical removal and found the same pathological picture that I found in the first case, a rapidly-growing soft carcinoma. This case is only four months old so I cannot as yet say what the outcome will be. (I have previously given the outcome of this case.) I may add that before the operation I had her chest *x*-rayed and this was negative. Both cases had *x*-rays taken after operation.

These three cases were early examples of the typical inflammatory carcinoma in which the skin becomes red or purple, edematous and erysipeloid. This condition is present from the very beginning and is not to be confused with the same picture which may occur in the course of a more advanced carcinoma.

It is of particular interest in the first case that the redness and the edema varied over a period of three weeks and the same thing was true in the last case, the edema present on first examination being much more marked than two weeks later at the time of the operation.

Bell in 1841 in discussing breast carcinoma said: "When a purple color is on the skin over the tumor accompanied by pain, it is a very, very unpropitious beginning."

Several other observers, among them Klotz and Volkmann, have described the same condition occurring in the lactating breast. Billroth in 1871 and Rodman in 1889 each described this lesion. Schumann reported 11 cases including one of his own and more recently Lee and Tannenbaum reported 28 cases. According to their statistics this condition occurs in 1.3 per cent of all cases of breast carcinoma. Since then Lee has collected 100 cases.

The condition is frequently very acute and does not respond in any way to the usual treatment. The initial symptoms are heaviness and burning of the breast and increase in size. The increase is ordinarily diffuse but there may be a partially defined tumor not, however, of the usual stony hardness. It has occurred most frequently in pendulous breasts and one half of the cases are nullipara.

Early in the disease there are skin changes simulating low grade inflammation. Retraction of the nipple occurs late and the nipple may become edematous. Glandular involvement appears early. Later the skin becomes deep red or reddish purple and is hard and infiltrated. This description I have taken from Lee and Tannenbaum's paper as my cases were seen early and did not show this change so markedly. The infiltration is like erysipelas and may be extensive. There may be a temperature of 100° F. blood picture shows nothing. Later in the course minute areas of ulceration occur but there is no breaking down en masse. Pulmonary metastases are rapidly progressive when they occur. The patient's general nutrition remains good until late in the disease. The inflammatory symptoms appear early and are present apparently from the very beginning. As stated before skin involvement may appear later in other breast cancers but this is not the type of case under discussion.

In a considerable series of cases the age varied from twenty-six to fifty-one, average being forty-four. Lactation has no apparent effect, being present in approximately 50 per cent of the cases. The differentiation must be made practically only from

abscess. Absence of an etiological factor, an ill-defined tumor, slight if any temperature elevation and no leucocytosis, should clear the diagnosis.

Sections of both these breasts showed a medullary carcinoma with a small amount of connective tissue stroma. I am sorry to say I did not section the skin as it is involved early and certainly would have shown invasion by carcinomatous cells, particularly in the first case. Lee has obtained cultures of streptococcus viridans from macerated tissue in one case.

TREATMENT

Radiation possibly offers more than anything else in the advanced cases as a palliative measure. As a matter of fact, the advanced cases do poorly under any sort of treatment. Surgical removal has seemed to hasten the course. I would not again operate on a case as advanced as the first one. The third one seemed much earlier and I thought it possible that removal would offer more than *x*-ray, but the outcome proved that my judgment was wrong.

If we are to accomplish anything we will have to see these patients earlier than most of those reported. If so, it is possible that by an early diagnosis and early treatment, some may be saved.

I have avoided any reference to the use of the cautery as it seems to me that if the disease has infiltrated the tissues diffusely, it will certainly not make any difference and if it has not, removal with the knife will be sufficient.

VAGINAL CESAREAN SECTION

WITH CASE REPORT*

Anthony Wollner, M.D.

THE indications for vaginal cesarean section being quite limited, suitable cases are rarely seen. Perfection of the technic and variations in the methods of abdominal section have placed the vaginal operation in the background. Since Duehrssen introduced the vaginal section into obstetrical surgery in 1896, the indications for the operation have undergone numerous changes, the low cervical and extraperitoneal modifications of abdominal cesarean section having almost entirely superseded the vaginal operation. Although the popularity of abdominal cesarean is justified, there are, nevertheless, certain cases encountered in obstetrical practice in which the vaginal section is preferable. This is well illustrated by the following case:

K. B. thirty-five years of age, white, female, came under my observation on December 13, 1928. The patient being in a semi-conscious condition, the following history was secured from her family physician:

Family History. Father died at thirty-four, following a cranial operation which revealed cerebral syphilis. Family history otherwise negative.

Past History. No previous illnesses with the exception of anemia and nervousness at twenty-one years of age, diagnosed as chlorosis.

Menstrual History. Began at fourteen, six to seven-week interval, duration four to five days. Prior to each menstruation, patient had hot flushes in the head and neck; backache and cramps for the first two days of the period.

Marital. Married four years. Pregnancy 1924, miscarriage of six to seven-week fetus, following an accident.

Present Illness. The patient was first seen by her family physician in February, 1928.

Physical Examination. Heart normal, lungs clear, all reflexes slightly increased, slight anemia.

Urine Analysis. Faint trace of albumen.

Uterus. Anteflexed, slight erosion of cervix with profuse discharge. The erosion was

*Read before the Section on Obstetrics and Gynecology, N. Y. Academy of Medicine, November 26, 1929.

treated with silver nitrate applications, with marked benefit. Adnexa normal.

May 26, 1928, patient complained of nausea and vomiting in the morning during the preceding two days. Last menstrual period began April 28.

Examination. Bluish discoloration of the cervix, uterus slightly enlarged and soft. Left ovary enlarged to size of a walnut. This was thought to be the corpus luteum gravidarum. On subsequent examination the left ovary was found the same size, and the uterus enlarged progressively as in normal pregnancy.

There was no change in the patient's condition until November 7: Blood Pressure 140/80; fundus one finger above umbilicus; fetal heart sounds loud. Urine analysis as on previous examination.

November 14, patient complained of pain in the lower abdomen and right upper quadrant. Rest in bed and a restricted diet were prescribed. The pains disappeared after six days.

November 23, pains of same character recurred, with impairment of vision. Patient complained of seeing small black spots. B. P. 180/100. Fetal heart sounds of good quality. A more strict diet and a belladonna preparation were prescribed.

November 30, patient complained of uterine cramps and slight bleeding from the vagina. Size of uterus that of a six to seventh-month pregnancy. Urine analysis albumen 0.27 per cent; moderate number of hyaline and few granular casts.

December 1, patient restless, complained of insomnia, severe headaches, and apprehensive. Blood chemistry; non-protein nitrogen 67.57 per cent. Increased impairment of vision. Cessation of bleeding on the following day.

December 6, ascites. B. P. 210/110; pulse 100, increased impairment of vision. Patient was removed to the hospital. Eye ground examination; small effusions and papillary edema, diagnosed as albuminuric retinitis. Consultants advised waiting for spontaneous delivery and the patient was discharged.

December 8, no fetal heart sounds heard, patient no longer felt life; restlessness and headaches more marked; patient could not distinguish the number of fingers at a distance of ten feet. B. P. 190/100, pulse 105.

December 13, attack of dyspnea, chill, short period of unconsciousness. I was then called in consultation.

The clinical picture was that of a grave toxemia of pregnancy and immediate interruption of the pregnancy was indicated. Because of the intensity of the toxemia, the method of interruption affording the quickest and most painless termination was selected. Cervical dilatation and the introduction of a bag were considered inadvisable for the following reasons: (1) because the rigid soft parts of an elderly primipara might not dilate sufficiently, and (2), because this method would not exclude labor pains. The choice for a rapid delivery lay between the abdominal and vaginal section. Because of the fact that the fetus had been dead for the last ten days, abdominal section was not justifiable, particularly since the much less dangerous procedure of vaginal section was available.

DESCRIPTION OF OPERATION

Usual preoperative preparation, disinfection of the vulva and vagina with green soap and douching; catheterization. Vaginal retractors are introduced and the cervix visualized; two vulsella applied at either side of the median line and the cervix drawn downward. A transverse incision is made on the anterior surface of the cervix, going through the vaginal mucous membrane. The bladder is pushed upward from the anterior cervical wall, using one finger covered with gauze for this purpose (the bladder is separated very easily from the cervix in pregnant women). The bladder is pushed upward until the uterovesical fold of peritoneum can be visualized at the upper angle of the wound. The bladder is retracted by the insertion of a narrow speculum, and in this manner the anterior wall of the cervix is exposed. Traction is made with the cervical vulsella and the anterior wall of the cervix is split with scissors in the median line up to the internal os. This brings the bag of waters into the opening (up to this point in the operative procedure there is practically no hemorrhage). When the bag of water is opened, the liquor amnii is evacuated. The size of the opening into the uterine cavity is now tested by means of the introduction of the closed fist, and determination is thereby made of the adequacy of this opening for the extraction of the fetus. The fetus being non-viable, delivery may be accomplished by means of craniotomy. After perforating the cranium a large portion of its contents is removed. At this stage of fetal development the cranial bones are soft and thin. The use of a cranioclast is contra-

indicated, and delivery is accomplished by means of version and podalic extraction. In this case version and extraction were accomplished without difficulty, and a macerated seven-month fetus delivered. The placenta and membranes were expelled by gentle expression after a ten-minute period. Previous to the versional extraction all instruments are removed from the vagina in order to gain more space and prevent injury to both the maternal tissues and the hand of the operator. Upon completion of the delivery the instruments are reapplied and the operative field inspected. In this case it was found that the incision on the anterior surface of the cervix had not been extended by tearing and the hemorrhage did not exceed that of a normal delivery. One cubic centimeter of obstetrical pituitrin is injected into the wall of the cervix before suturing. Traction is made on the vulsella in order to bring the uppermost angle of the wound into view; interrupted chronic catgut sutures are used, which extend through the muscularis but which do not include the mucosa. The uterine cavity is packed with gauze, and a strip of gauze is left in the subperitoneal wound for a twenty-four hour period. The vaginal edges are united by means of interrupted catgut sutures. The duration of the operation in this instance was thirty-five minutes.

POSTOPERATIVE PERIOD

The rapid recovery following operation in this case was remarkable. Ten hours postoperative the patient did not give one the impression of an operative case. There were none of the usual signs of the after effects of a laparotomy; with the exception of slight uterine contraction, the patient complained of no discomfort. The temperature rose to 100°F. on the first day; after this it remained between 98.8° and 99.4°F. The pulse rate remained unchanged and was about 100°F. as before operation. On the sixth day there was a gradual decrease of the pulse rate and this became normal on the tenth day. A considerable improvement in vision was noted as early as the first day. On the second day the patient could distinguish the fingers of a hand, and there was continuous improvement until the tenth day, when the patient was able to read. The urine which had shown a four plus albumen reaction prior to the operation was two plus on the sixth day and continued so until the patient was discharged from the hospital. Blood pressure on the fourth day was 140/88, on the tenth day 130/86. The patient voided spontaneously from the first day. Examination on discharge revealed a normally involuted uterus and normal adnexa. Vaginal examination showed primary union of the incision and a normally shaped cervix.

In this operation I deviated in two respects from the usual technic of vaginal section. As a rule the operation is commenced with a deep episiotomy. This shortens the length of the vaginal canal, makes the cervix more accessible, and prevents the irregular tears of the vagina and perineum during the extraction of the fetus. I do not feel that the episiotomy is advisable, as there is considerable hemorrhage from the incision. This is occasionally difficult to check and consumes valuable time. In many instances there is a greater loss of blood from this procedure than from the vaginal section itself. If the section is performed in a case of prematurity or in the case of a mature but dead fetus, where the delivery can be accomplished by means of craniotomy, we do not have to anticipate injury to the vagina or perineum. In those cases in which a mature living fetus is delivered there may be a need for episiotomy, but in these cases it may be done at the time when it becomes imperative.

Another deviation from the routine procedure was the use of one anterior incision only, on the cervical wall. Duehrssen insists that two incisions be made; one anteriorly and one posteriorly. Most obstetricians familiar with the method are in accord with Duehrssen. We, however, share Bumm's opinion and find that the anterior incision, if extended, gives sufficient space for even a full-term child. The omission of the episiotomy and posterior incision of the cervix shortens and simplifies the method considerably and therefore makes the operation of greater value in toxic cases.

Vaginal cesarean section involves two important hazards which one must care-

fully avoid. One of these is injury to the bladder or ureters. This can be obviated by reaching the proper layer when making the first transverse incision; it must extend sufficiently through the vaginal mucosa. If one reaches the proper layer there is no difficulty in pushing the bladder upward by means of one gauze wrapped finger. Should there be any difficulty in locating the bladder, its lowest point may be located by means of the introduction of a metal catheter.

When the bladder has been pushed upward to the required extent, one must be sure it is well retracted so that there is no danger of injury when the cervical incision is made. Anyone experienced in pelvic surgery should have no difficulty in avoiding injury to the bladder. Before placing the cervical sutures the bladder should be catheterized to make certain that it is undamaged.

An additional point that must be borne in mind is that the cervical incision may extend by tearing during the delivery of the fetus. Should this tear directly upwards into the corpus of the uterus, it may open the peritoneal cavity; but this is not a serious complication if it is repaired promptly. On the other hand, should this tear extend in a lateral direction toward the parametrium, there is danger of rupturing the uterine artery or vein, with profuse hemorrhage. Such an accident may necessitate the ultimate removal of the uterus. However, if the original incision of the cervix is absolutely in the median line and of sufficient extent, there is no likelihood of a lateral tear. One must remember before making the cervical incision that the cervix may be rotated to one side, and careful examination must be made therefore before the incision. There is no hemorrhage from the cervical incision if done correctly and if traction is made on the vulsella. If the cervical incision is made up to the peritoneal fold there is ample space for the passage of a mature fetus, as this incision is as extensive as that of a low cervical cesarean section.

Difficulty may be experienced in attempting to deliver a mature fetus through the unprepared vagina. If forceps is applied, or if version is done, and the extraction of the aftercoming head is done too rapidly, laceration is more likely.

In the delivery of a mature living fetus one may be faced with a situation where there is a conflict between the interests of the mother and that of the child. If one is too cautious in the delivery of the fetus it prolongs the operation and imperils the life of the child. On the other hand, if a rapid delivery is accomplished, the upper portion of the vagina can hardly escape grave injury. This presents a paradoxical situation for the obstetrician, and it is for this reason that we do not advise vaginal cesarean section in cases where one is dealing with a mature living child. In such a case, the apparent advantage of vaginal section is outweighed by the resistance offered by the unprepared vagina during delivery; in the case of a mature living child preference should always be given to the abdominal operation.

In those cases where the fetus is premature or is mature but dead, the above mentioned dangers are of less importance, and in this group the vaginal cesarean section has decided advantages. The convalescence following a vaginal section is more rapid and the usual unpleasant symptoms following laparotomy are avoided. The patient regains her strength and resistance in an amazingly short postoperative period, which is of special significance in cases of toxemia. The vaginal cesarean section obviates exposure of the peritoneum and the duration of the operation is shorter. There is no record in the literature of any complication in subsequent pregnancy or labor because of the cervical scar. Another advantage of this operation is the avoidance of peritoneal infection as the entire procedure is extraperitoneal.

CONCLUSION

In cases where one is dealing with unpre-

pared softs parts and where a rapid painless delivery is essential, one has the choice of either abdominal or vaginal section. The decision should depend entirely on the condition and age of the fetus. If the fetus is mature and alive, abdominal cesarean section is the method of choice and gives more satisfactory results. If, on the other hand, the fetus is premature, or is mature, but dead, the vaginal cesarean section should be performed. The indications for vaginal cesarean section are very limited; but in properly selected cases the advantages which it offers are unsurpassed by any other method.

COSMETIC RESULT IN A CASE OF MARKED SCOLIOSIS

WITH ROTATION OF THE RIBS TREATED BY CONVEX FRAME, SPINE FUSION AND RIB RESECTION*

JOSEPH BUCHMAN, M.D., F.A.C.S.

BROOKLYN, NEW YORK

A GIRL fourteen years old was admitted to the Hospital for Joint Diseases on August 15, 1928, with the complaint of deformity of the back of two years' duration.

Examination showed a very marked right dorso-lumbar scoliosis with marked rotation of the ribs to the right, and a collapse of the trunk, as shown in Figure 3. After being kept on a convex frame for several months, the patient was operated upon by Dr. Samuel

FIG. 1. Anteroposterior roentgenogram of spine before operation.

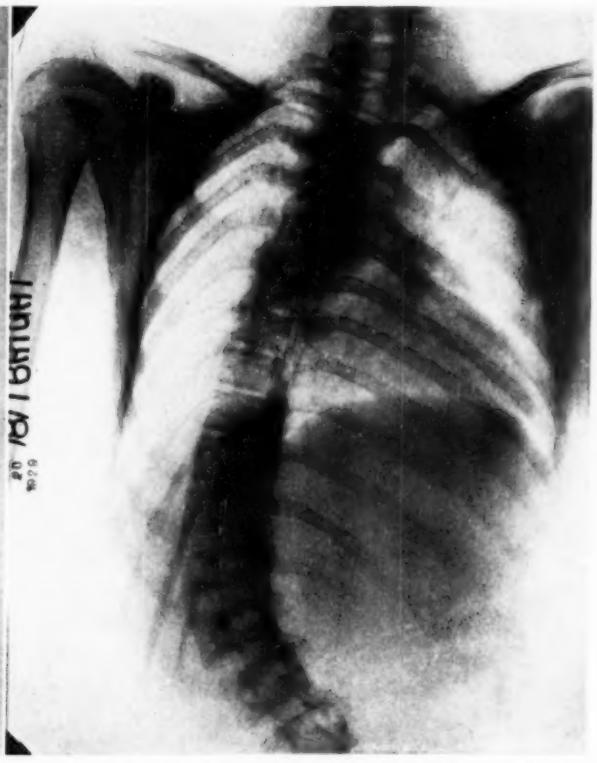


FIG. 2. Anteroposterior roentgenogram of spine eight months after spine fusion. Note improvement in curvature. The beef bone graft is beginning to be absorbed. There is considerable bony callus formation.

* Presented before Section of Orthopedic Surgery, New York Academy of Medicine, October 19, 1929.

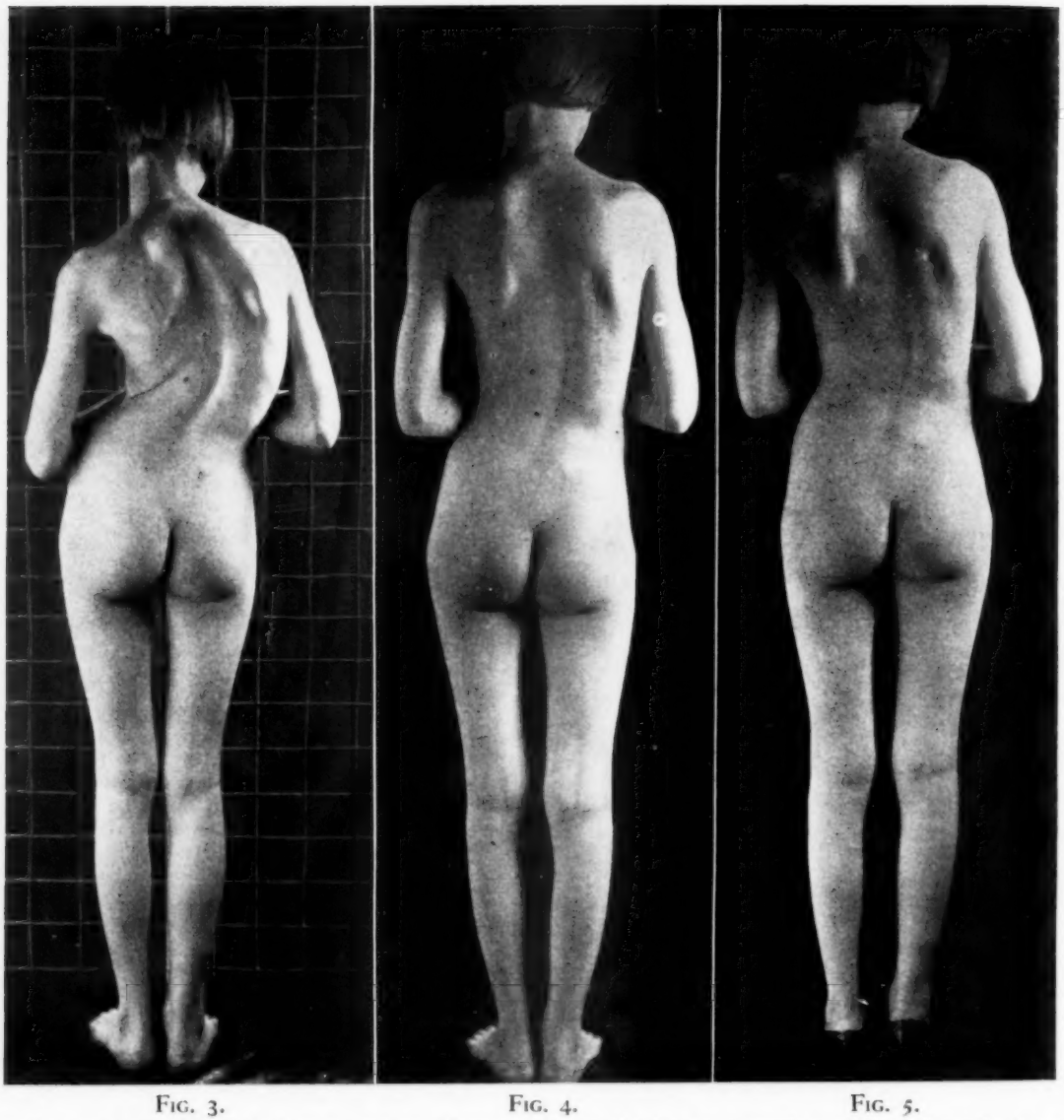


FIG. 3. FIG. 4. FIG. 5.

FIG. 3. Appearance of back before operation. Note sagging and shifting of trunk to right and marked rotation and prominence of ribs on right side.

FIG. 4. Appearance of back after spine fusion and rib resection.

FIG. 5. Appearance of back when apparent shortening of right lower limb is compensated by an inch lift of right shoe.

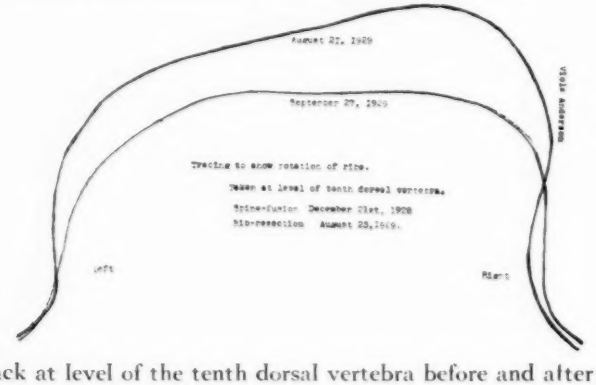


FIG. 6. Tracing of back at level of the tenth dorsal vertebra before and after rib resection to show improvement in deformity.

Kleinberg, who performed a spine fusion from the fifth dorsal to the second lumbar vertebra, and inserted a beef bone graft on the concave side of the curve. Ten days later the patient was replaced on a convex frame and on February 1, 1929, the child was discharged wearing a plaster of Paris jacket.

She was readmitted to the service of Dr. Kleinberg, at the Hospital for Joint Diseases on August 20, 1929, for the correction of the deformity due to the rotation of the ribs.

Examination at that time showed that the back was markedly improved, that the operated area was stiff, that the patient's posture was considerably improved, and that she was several inches taller than on the previous admission. It was also noted that there was an apparent shortening of the right lower limb of 1 inch. On August 23, 1929, a rib resection, as advocated by Dr. Armitage Whitman, was performed by me. I removed about two and a half to three and a half inches of the sixth to the eleventh ribs inclusive. Eleven days later the patient was placed on a convex frame and four weeks thereafter she was discharged, markedly improved in appearance and in general condition.

This case was presented to demonstrate the cosmetic result obtainable by means of the convex frame treatment, spine fusion and rib resection.

MYXOGLOBULOSIS OF THE APPENDIX*

W. C. Hueper, M.D.

CHICAGO, ILL.

RETENTION cysts of the appendix with mucous content were first described by Fraenkel in 1901 and appear in the literature under various names as hydrops of appendix, colloid or pseudomucinous cyst, myxocele, mucocele, mucinous cyst, pseudomyxoma, etc. They are rather rare, if a correct conclusion can be drawn from the number of cases reported. Weaver[1] collected 168 cases in 1928 from the literature. An uncommon variety of this condition is the myxoglobulosis (Hansemann[2]) or the fish egg appendix (Morrison[3]). Weaver found only 8 cases recorded of this type which number Hudacsek[4] could increase to twelve in 1929. The condition is characterized by the presence of globoid bodies of mucinous character in the cystic content resembling in their gross appearance fish eggs. These balls vary considerably in size and may reach one centimeter in diameter. They contain occasionally calcifications. They represent inspissated balls of mucoid material around minute masses of necrotic material and are composed of mucin and pseudomucin sometimes arranged in concentric layers. The lumen of the appendix is more or less distended and lined by a straight, sometimes stratified layer of cylindrical mucus-producing cells of goblet cell type. With the increasing pressure of the mucous content degenerative changes of the epithelial cells may occur, resulting in a self-limitation of the process. The submucosa is fibrous and contains no or very little lymphoid tissue. A mucinous imbibition of the submucosa is sometimes observed. The muscularis is usually thinned, but also hypertrophy may be seen (Hudacsek[4]). Stenosis of the lumen at the cecal os with continuation of the mucus production by the mucosa and with absence of an infection is regarded as the causative mechanism of this condition. The stenosis may be due to a constrictive scar formation from a preceding appendicitis (Aschoff[5]), or due to angulation, torsion, compression by adhesions, invagination into the cecum, foreign bodies or parasites in the lumen of the appendix. The clinical symptoms

* Submitted for publication December 30, 1929.

produced are usually those of a chronic appendicitis. As secondary complications, we find listed, ileus, volvulus and rupture

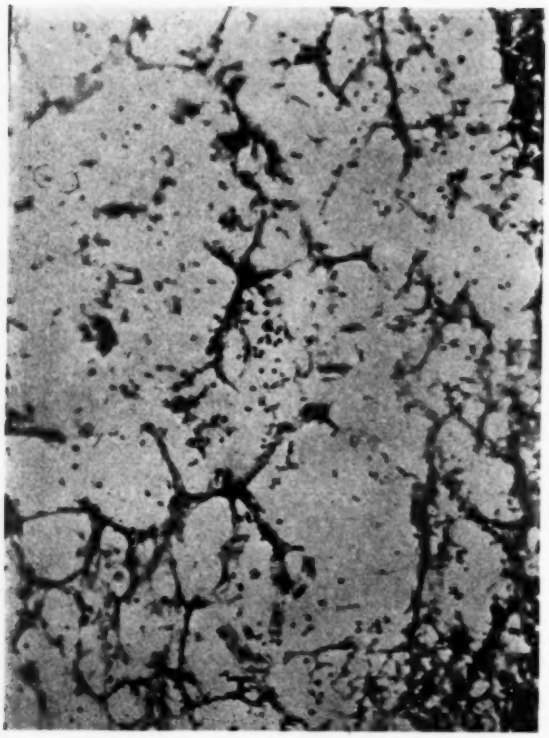


Fig. 1. Myxomatous area in submucosa.

of the appendix with subsequent pseudomyxoma peritonei (Morrison,[3] Wegener[6]), which, according to Hudacsek,[4] shall differ in prognostic respect from that following a ruptured ovarian cyst. While the latter is, as a rule, fatal in spite of surgical interference, the former offers a good prognosis. In Hamdi's[7] case only were metastases found in the liver and breast, so that Hudacsek claims they were of benign nature.

CASE REPORT

Mr. M. K., thirty-five years old, had for the last three years attacks of pain in the lower abdomen which were acute in onset, cramp-like in character and lasting from a few hours to a couple of days. They appeared in intervals of weeks and months and had not increased in severity. The last attack was similar in character to those previously observed, but the pain became most prominent over McBurney's point. There was no nausea or vomiting present. The physical examination at the time of admission was negative with the exception of a slight tenderness and rigidity in the lower right quadrant showing no increased tender-

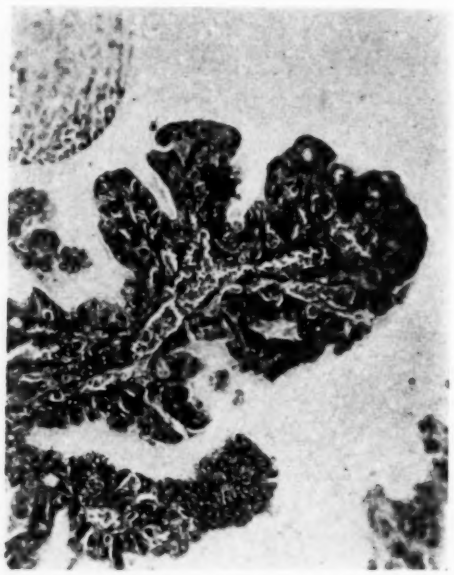


Fig. 2. Papilloma with atypical epithelium and portion of mucous globule.

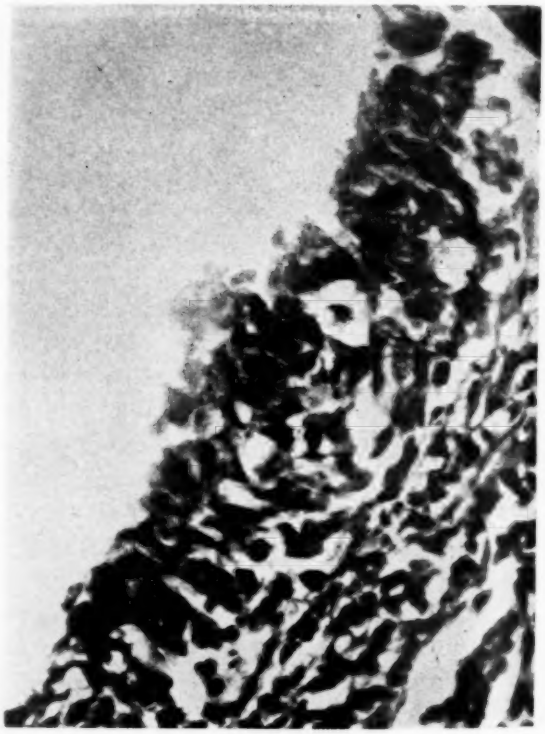


Fig. 3. Hyperchromatic, atypical epithelium lining portions of appendix.

ness upon palpation of this region. But an elongated mass was felt here. Blood count: 6700 leucocytes, 47 per cent polymorpho-

nuclear neutrophiles, 43 per cent lymphocytes, 6 monocytes and 4 eosinophiles.

Operation: the appendix was 15 cm. long and 3 cm. wide. The subserous vessels were hyperemic. The base of the appendix appeared to be invaginated into the cecum for a distance of 1 cm., so that it had to be dissected out of the intestinal wall by the knife. The amputated appendix appeared to be filled with a smooth substance of paste-like consistency. The different layers of the wall were easily discernible. The lumen of the appendix measured 2.5 cm. in diameter. After the appendix was opened by a longitudinal section, a mass was removed consisting of smaller and larger yellowish white, opalescent globules surrounded by a clear gelatinous material.

The *microscopical examination* showed a mucosa consisting of a single, straight layer of high columnar, mucus-producing cells. The lining was frequently defective. The cylindrical epithelium showed evidence of regressive changes at the periphery of the defects. The cells became gradually lower and smaller till they disappeared completely as a delicate, dark line. Glandular formations were only occasionally seen. The submucosa was fibrous in character and more or less densely infiltrated with eosinophilic cells, leucocytes and lymphocytes. In the cecal portion of the appendix areas of mucinous imbibition of the submucosa were encountered (Fig. 1). The epithelial lining covering these myxomatous zones consisted of narrow, dark-stained, indistinctly outlined cells. The muscularis was thickened and showed an eosinophilic and lymphocytic infiltration of moderate degree. The mucoid globules consisted of mucin and pseudomucin and were sometimes surrounded by a leucocytic coat. In a section from near the cecal end a small papilloma was present. It showed a very vascular loose stroma with finger-like projections covered by a rather irregularly shaped, somewhat vesicular epithelium with round, hyperchromatic nuclei. The epithelium of the adjacent parts of the appendix was composed of similar cells (Figs. 2 and 3).

CONCLUSIONS

It is thought that the small papilloma was the cause of peristaltic contractions of the appendix resulting in its invagination into the cecum. The compression of the cecal os of the appendix thus produced is the cause of the retention. The continuation of peristaltic movements may have produced the globular arrangement of the mucus. Considering the rather atypical character of the epithelial lining of the papilloma, a rupture of the appendix might not have proved as harmless as generally observed.

I am indebted to Dr. P. Kreuscher for the history of the case.

BIBLIOGRAPHY

1. Weaver. Mucocele of the appendix. *California & West Med.*, 28: 500, 1928.
2. Hansemann. Quoted by Hudacsek.
3. Morrison. Mucocele of the appendix. *Boston M. & S. J.*, 188: 532, 1923.
4. Hudacsek. Pseudomyxoma des Wurmfortsatzes mit "Myxoglobulose." *Arch. f. klin. Chir.*, 155: 694, 1929.
5. Aschoff. Quoted by Hudacsek.
6. Wegener. Ileus durch Schleimcyste des Processus vermiformis. *Zentralbl. f. Chir.*, 52: 971, 1925.
7. Hamdi. Quoted by Hudacsek.

ANATOMIC RESTITUTION OF A FRACTURED CLAVICLE*

EDGAR M. BICK, M.D.

NEW YORK

THE fractured clavicle as usually met in general practice causes no great concern to the surgeon. Any one of the many accepted methods of partial immobilization offers the probability of an excellent functional result. However, the frequent residual swelling and decrease in the width of the shoulder, while unimportant to the steel worker, may be objectionable to the lady whose evening dress forms an essential part of her wardrobe. This report concerns such a case. At the suggestion of Dr. Armitage Whitman, in whose care the patient was placed, the following method of reduction was successfully applied. We believe it to be original and useful.

FIG. 1.

Mrs. E. G., aged twenty-nine, fell from her horse two and a half days before admission to the hospital, fracturing her clavicle at the juncture of the middle and outer thirds. The usual adhesive strapping had been applied immediately after the accident, but a protrusion due to the overriding outer fragment, and the coincident asymmetry of the shoulders caused considerable anxiety. She applied for further treatment to reduce the deformity.

FIG. 2.

Her past history and general physical examination are irrelevant. There was no pain, very little tenderness, and no circulatory or nerve disturbances. In short the case was that of a typical "broken collar bone."

A roentgenogram confirmed the diagnosis, and is herewith presented (Fig. 1). The left clavicle between the middle and outer thirds is fractured transversely; the outer fragment overrides about 2 inches.

The patient was taken to the operating room and placed upon a Hawley table. Her head and neck rested upon the shoulder piece; her waist and hips upon the main body piece. The shoulder piece was pulled out as far as possible, leaving the back of the patient exposed except for the narrow metal strip connecting the two parts. In this position the shoulders and back were free for manipulation. A double layer of felt $2 \times 3 \times 4$ in. was placed between the scapulae, resting on the connecting strip. This served to elevate the interscapular region.

* From the First Orthopaedic Service, Dr. Royal Whitman, Hospital for the Ruptured and Crippled, New York City. Submitted for publication October 11, 1929.

The left arm was allowed to drop posteriorly and then brought to 100° abduction. This position was maintained by an assistant. It must be emphasized that the posterior drop of the arm and shoulder was entirely gravitational. The opposite shoulder, unrestrained, serve as a balance.

In this position it was apparent to the operators that the protrusion over the site of fracture had disappeared. Sheet wadding was wrapped about the left arm and shoulder, and around the trunk from the axilla to the iliac crests. Over this a plaster-of-Paris spica was applied. The head piece was pulled cephalad, thereby removing the connecting rod from the spica, and the patient was placed on a stretcher. Shortly afterward the plaster was trimmed, exposing the clavicular area, and a portion was removed over the anterior surface of the forearm and antecubital space. This permitted motion at the elbow, and the patient could use her left hand in eating, card-playing, etc. (Fig. 2).

After forty-eight hours the patient was permitted to sit up in a chair, and even to walk. A second roentgenogram taken a few hours after reduction shows complete restitution of the fragments to their normal positions (Fig. 3).

Thirteen days later the spica was removed. The symmetry of the shoulder was perfect. A slight swelling over the site of fracture, while palpable, was barely visible. The patient was then given a supporting sling, mainly as a reminder to care for the shoulder during an impending long train voyage.

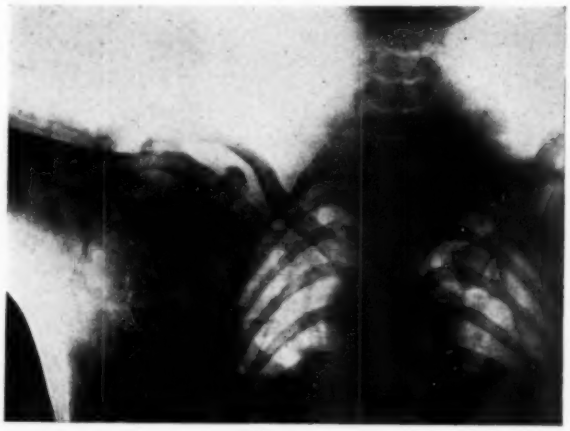


Fig. 3.

This method of reduction is one to be used in those cases of fractured clavicle in which anatomic restitution is necessary to prevent deformity. True, it appears cumbersome, but ten to fifteen days so spent may save many moments of embarrassment later.

TWO INTERESTING HAND CASES*

Leo Mayer, M.D.

NEW YORK

My purpose in the case reports is to illustrate methods of conserving tendon function and to show the technic of tendon transplantation which is applicable to this type of injury.

Case 1. A young boy cut his hand on a milk bottle a year ago. As is well known, milk bottle injuries are invariably infected; I have never heard of any that did not become infected. The physician who saw him did not try to attach the tendon at the time of the accident; he put in a drain and let the wound granulate, and at the end of three weeks referred the boy to me. The wound was well healed. Cutting down on the tendon, I found the flexor profundus and flexor sublimis of the third finger had been cut through, leaving a space of about 2 in. between the two ends. Traction on the proximal stumps did not appreciably lessen the gap.

In a case of this kind, the simplest and most effective procedure is to sacrifice the sublimis and concentrate on the profundus. The operation is done by splicing a graft taken from the sublimis tendon between the stumps of the profundus tendon. The operation takes about forty minutes.

The postoperative care of these cases is

* Read before the Section of Orthopedic Surgery, N. Y. Academy of Medicine, January 18, 1929.

tedious. Three or four months are required before proper function is restored.

The action of the transplanted tendon in this case is not 100 per cent perfect. I have not succeeded in getting perfect results; there is always a little slack in the tendon that I have not as yet been able to correct. This boy uses his fingers together very well, but on trying to use the third finger alone he cannot get it quite to the palm. The operation requires a rather fussy technic; we must operate quickly, for we cannot leave the Esmarch bandage on more than an hour.

The next case is an altogether different type:

Case II. The patient scraped his hand on a nail, and developed a small infected spot on the dorsum of the hand. The infection looked very mild and I opened the abscess under novocaine. Some hours later the patient telephoned and reported that he was suffering severe pain, and on seeing him I found the wound surrounded by a black area about the size of a silver dollar. It made me suspect anthrax, and I rushed him to Dr. Stetten, who also suspected anthrax. I made a broad excision of the blackened tissues and packed the wound with hexylresorcinol. Despite the excision, his temperature rose to 102°F. the wound edges sloughed, and the infection continued to spread. A few days later I attempted a second excision and found that the infection had involved the entire dorsum of the hand; the skin was eaten away, the fascia was gone, etc., and the infection had extended up about two-thirds the distance to the elbow. The cultures showed no anthrax bacillus only staphylococcus, with nothing peculiar about it except that it grew in anaerobic as well as in aerobic cultures.

At that time the patient was seen by Dr. Stetten and Dr. Herold Neuhof.

I was very much disturbed, for the patient was a well-known violinist, and I thought he would never play the violin again. Dr. Neuhof thought it looked like an anaerobic infection and advised the use of hydrogen peroxide. I got an arm bath and filled it with warm peroxide, and immersed the arm in it. In an hour the condition was slightly improved; in three hours the wound looked definitely better, and it was evident that the infection had been checked. Within two days, the wound looked normal, and in a week's time the entire hand was covered with healthy granulations.

Then came the question of how to cover that huge granulation area. Of course, it is necessary when dealing with skin over a superficial joint to use either a Wolff graft or a pedunculated graft. I removed a flap from the abdominal wall 11 in. long by 4½ in. wide. The graft healed very nicely. The patient has complete control of his fingers and is able to play the violin as well as ever.

The graft seems smaller than at the time of the original implantation; the cosmetic effect is not entirely satisfactory, owing to the thickness of the graft, but I hope to be able to improve that later. The most interesting point, however, is that we were able to save the function of the tendons. Another interesting thing is the ingrowth of the nerve fibers from the upper part growing downward, so that the patient has sensation over one-fourth of the graft.

MESOTHELIAL TYPE OF MALIGNANT HYPERNEPHROMA WITHIN A SOLITARY CYST OF THE KIDNEY*

J. SYDNEY RITTER, M.D.

NEW YORK

MRS. M. T., aged thirty-seven years, married, was referred to me on July 6, 1927 by Dr. L. A. Shifrin. At this time the patient complained of a palpable mass filling the right side of the abdomen together with severe, piercing pain in this region which radiated dorsally.

The family and past histories were irrelevant.

The present illness dated back to March 1927, on which date the patient had a similar attack of pain and fullness which lasted a few hours.

On her first examination the physician made the diagnosis of a possible ovarian cyst; however, when examined by a gynecologist a week later a definite denial of an ovarian cyst or any tumor was made. She had had three other attacks following this one with similar experiences and not until the patient came under the care of Dr. Shifrin was renal disease suspected. He suggested a complete urological examination. From the history of the case we made a tentative diagnosis of intermittent hydronephrosis, the causative factor not being determined, but advised hospitalization for study.

July 6, 1927, she was admitted to the New York Post-Graduate Hospital, at which time the complete examination was made:

Physical Examination: Fairly well-nourished adult, female, weighed about 128 lb., in good general physical condition. Heart and lungs were normal. Abdominal palpation revealed a firm, tender, palpable mass in the upper right quadrant which extended down into the pelvis on the right side.

By vaginal examination this mass was found not to be attached to the uterus, as shown in Figure 1.

Cystoscopic Examination: A No. 24 McCarthy cystourethroscope was introduced. The bladder was found to be trabaculated. The vesical sphincter was normally located and normal in appearance.

Indigo carmine injected intravenously appeared on the left side in three minutes with good concentration in five; from the right side the dye appeared in eight minutes, with a 3 plus concentration in eleven.

Ureteral catheters were passed to both renal pelves without difficulty. Urine obtained from both sides was clear and negative but for a faint trace of albumin.

A pyelogram was then made on the right side, using 15 c.c. of a 12.5 per cent solution of sodium iodide. The patient complained of some pain in the region of right kidney. An *x*-ray exposure was made. The catheter was withdrawn and the ureter distended with sodium iodide and another exposure was made. Several *x*-rays were taken prior to the pyelogram.

X-ray Report (Fig. 2): July 6, 1927. Examination of the genitourinary tract shows the left kidney to be of comparatively normal shape, size, position and illumination; the lower pole was opposite the upper border of the third lumbar vertebra.

Examination of the right kidney after the injection of the contrast substance showed the kidney much enlarged. The enlargement was mostly towards the lower part. The lower pole was below the iliac crest. The kidney pelvis appeared to be normal. The calyces were somewhat irregular (Fig. 2). Diagnosis: solitary cyst or tumor of kidney.

Operation. On August 12, 1927 this patient was operated on. Through a right hockey stick incision the kidney was exposed; the upper pole was easily delivered, due to the fact that the entire kidney was rotated and pulled down out of its former location. From about the middle of the convex surface a distinct cyst-like tumor was found to be firmly incorporated with the kidney and extending well down into the pelvis. Due to some adhesions between the cyst wall and the peritoneum it was necessary to open into the peritoneum to determine the extent of the mass and the possibilities of its attachment to any intra-abdominal organ. I was particularly anxious as to its being in any way associated with the ovary and as to its relationship to the ascending colon.

With one hand in the abdomen I was able to free the peritoneum from the tumor; however this was not accomplished until I had separated the growth from the kidney. On

* Read before the Section of Genito-Urinary Surgery, N. Y. Academy of Medicine, Dec. 18, 1929

cutting the tumor I noted a large clot of old coagulated blood together with many papillomatous masses lining the cavity.

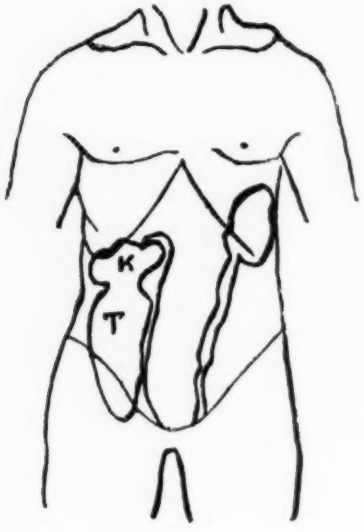


Fig. 1.

Due to the fact that some of the tumor was attached to the kidney a nephrectomy was done. On the operating table a diagnosis of cyst-adenoma simulating that of the ovary was made. The wound was closed in the usual

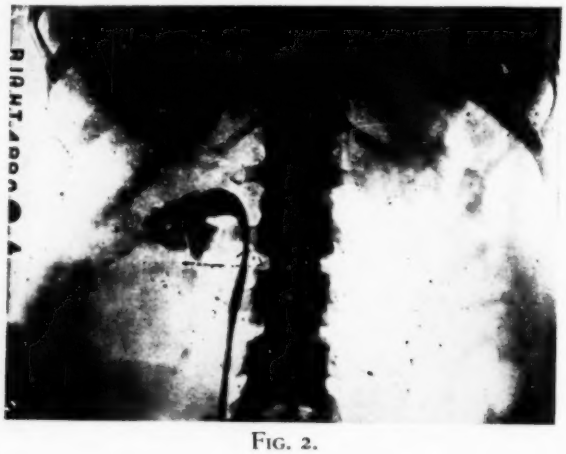


Fig. 2.

manner and patient returned to bed in good condition.

Pathological Report (Fig. 3): One specimen is a small kidney measuring 95 × 43 mm. It has been removed with a small portion of ureter. At the convexity there is an excavation, elliptoid in shape, which occupies a length of 55 mm. and a width of 33 mm. This excavation is more or less smooth walled, with a small amount of kidney tissue projecting in an irregular fashion. At one edge there is a small papillary projecting tumor nodule which apparently has been torn off from a larger cystic tumor

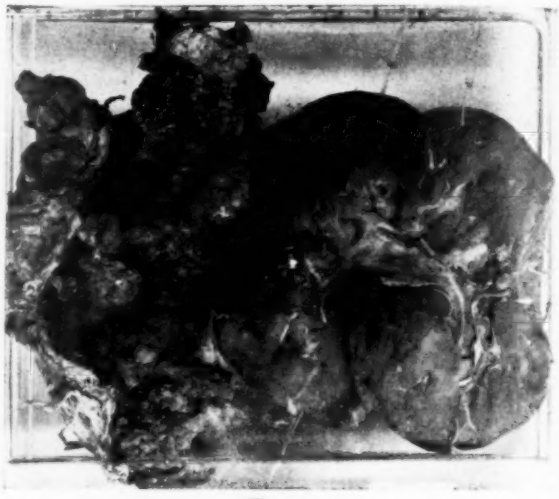


Fig. 3.

nodule. This small nodule measures 15 × 15 × 14 mm. It appears to be in connection with a tumor invading the kidney cortex proper which reaches a diameter of 14 mm. This invasive portion of the tumor can be seen to bulge out on the surface of the kidney opposite the nodu-

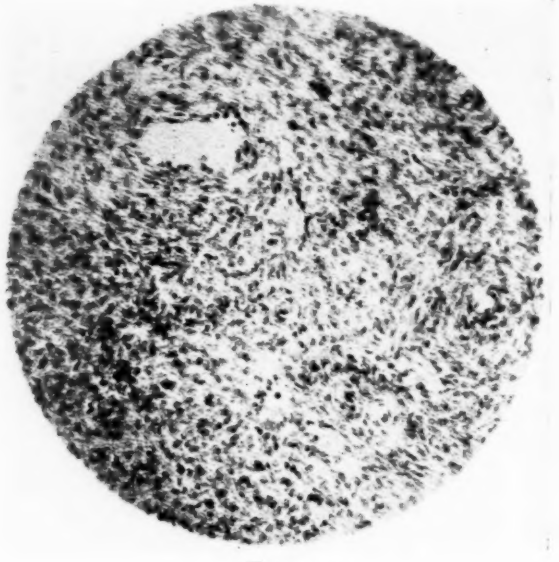


Fig. 4.

lar tumor in an irregular fashion for a distance of 19 mm. It is hemorrhagically discolored. The remainder of the kidney substance is negative. The cortical and medullary markings are well preserved. The pelvis and mucosa of the calyces is pale.

The second specimen is apparently a portion of a cyst wall which has been torn in several places. In its interior there are numerous larger papillary projecting nodules and several areas of dark brown, partly hemorrhagic clotted blood. This portion of the tumor, which apparently was in connection with the tumor on the kidney, measures $135 \times 55 \times 23$ mm. The tumor nodules on the interior of the membrane are very firm.

Microscopic Examination (Fig. 4): The papillary material and most of the wall of the cyst are composed of irregularly interlacing bundles of rather large acidophile spindle-shaped cells with irregularly oval vesicular nuclei, only moderately rich in chromatin and usually showing a nucleolus. These cells are frequently fragmented and are more compact and better preserved immediately around the blood vessels. Striations cannot be found in them and they appear not to be muscle cells. Van Gieson stain reveals no collagenous fibrils between them. In general the granular character of their cytoplasm indicates the presence of lipoid, as the yellow color in the gross specimen would also suggest. In some portions there are large globules of fat in the substance; mitotic figures are not recognized.

This is an unusual tumor. It is undoubtedly malignant and local recurrence with eventual extension is to be expected. It would appear to have developed from a remnant of displaced adrenal medulla beneath the renal capsule.

Diagnosis: Mesothelial type of malignant hypernephroma.

Follow-up Report: The further progress of this patient after being discharged from the hospital: She reported to the Memorial Hospital where she has been under the care of Dr. A. L. Dean, Jr., and a personal communication which I received this year is as follows: "I saw your patient, Mrs. M. T., on September 13, 1929. At that time she was enjoying perfect health and a physical examination revealed no sign of disease."

This case appears worthy of report due to the fact that in renal surgery, particularly where a diagnosis of cyst of the kidney has been correctly made, it is not sufficient to merely enucleate the cyst, but before leaving the kidney in situ it is advisable that the cyst be opened and examined for possible neoplastic growth.

It is of interest to attempt to explain the appearance and disappearance of this tumor mass. In the *x*-ray examination there was no communication between the cyst and the renal pelvis. We cannot therefor consider this to be a case of intermittent hydronephrosis but must accept the interpretation of the appearance and disappearance of the tumor mass as being due to intermittent hemorrhage together with reabsorption of the blood clot.

TORSION OF THE TESTICLE*

Clarence B. Whittemore, M.D., F.A.C.S., and Leonard Zweibel, M.D.

Johnson City, N. Y.

THERE are only 137 cases of torsion of the testicle reported in the literature, and it is therefore relatively rare. It is probably more frequent than is generally supposed, owing to the fact that the torsion may be only partial and that it may subside spontaneously with or without infection and under expectant treatment. The torsion consists of the rotation upon its longitudinal axis, causing thereby a sharp twist in the spermatic cord which may consist of one-half to four turns in either direction. The blood supply is interfered with, hemorrhagic infarct of the testis follows and the gland either goes on to suppuration, or more frequently to atrophy. It is very likely that many of these testes undergo atrophy without being diagnosed.

The etiology is obscure and has not been definitely determined. It is believed to be due to some congenital malformation

* Read before Endicott-Johnson Medical Society December 4, 1929 at Johnson City.

affecting the anchorage of testis and epididymis to its tunical bed, which gives the testis greater mobility than is normal. The undescended testicle is apparently peculiarly subject to torsion. It generally occurs through being induced by muscular effort, particularly of a sudden, severe sort, although it has been reported as having occurred during sleep in several cases. Torsion may occur at any age, but is chiefly seen between the ages of thirteen and twenty-one years of age.

The most frequent torsion is the intravaginal type, where an abnormally long mesorchium exists. Others are extravaginal, in which the entire testicular mass, including testicle, epididymis and tunica, rotates within the scrotal wall so that the cord is twisted in its extravaginal position.

The pathology is commonly agreed upon. The skin and subcutaneous tissues are thickened and edematous. The tunica is infiltrated and contains a thick, almost black, fluid. Usually there is a general thrombosis below the twist which, as previously mentioned, may vary from one-half turn to four turns, and the testicle may undergo hemorrhagic infarction with commonly resulting gangrene, or interlobular hemorrhage or atrophy, which is most common. If infection supervenes from the blood stream, the infarct suppurates and discharges to the outside. If there is simple necroses with no infection, the exudate is eventually resorbed, the necrotic tissue replaced by scar and complete fibrous atrophy finally results.

The symptomatology is not pathognomonic, although very suggestive. The onset is sudden with severe pain in the testicle and there may be nausea, vomiting and even mild shock, perhaps due to vagus nerve fibers. The temperature may reach 100°F. or higher. Swelling is noticed on the affected side, in either the scrotum or inguinal canal, with redness and edema of the skin which may go on even to an extreme degree. The testicle usually is not palpable in the scrotum due to the degree of swelling and fluid. Both local and general symptoms are exaggerated when the testicle is in the inguinal canal, and may very closely resemble in symptomatology a strangulated hernia.

Case Report: Infant boy, white, 8 months old, admitted October 8, 1929 to the Charles S. Wilson Memorial Hospital, Johnson City, N. Y. The child had been crying continually since the previous day, as if in pain. Had vomited on the previous day, as well as on the day of admission. Temperature on admission was 100°F. The patient had a fairly severe cough on admission. The mother noticed a swelling in the right inguinal canal since Oct. 7, 1929.

The child was a normal delivery and was normal physically but for umbilical hernia, first noticed at two weeks of age. Had been breast and bottle fed. Family history showed two children in family had whooping cough.

On physical examination, the child did not appear acutely ill, but had convulsive coughing spasms. Pupils reacted equally to light and accommodation. Nose and ears were negative. Tonsils and pharynx were markedly inflamed. Neck was negative. Heart and lungs were negative. Abdomen showed small umbilical hernia and mass in right inguinal canal size of a large walnut over region of external abdominal ring with long axis parallel to Poupart's ligament. The skin over the mass was tense, firm and red. The mass was tender and immobile, apparently adherent to the superficial and deep tissues. The testicles were not palpable in the scrotum. The left testicle was palpable, not enlarged, in the left inguinal canal.

The child had been sent to the hospital with the diagnosis of strangulated hernia.

On admission to hospital, Oct. 8, 1929, after above physical examination, diagnosis was made of: (1) traumatic oedematous undescended testicle on right, (2) upper respiratory infection.

The operation in right inguinal canal demonstrated a tense tunica vaginalis with much thick, dark fluid. There was torsion of the testicle which was gangrenous and appeared with the epididymis like one large undifferentiated hemorrhagic clot. There was marked gangrene and thrombosis extending up the spermatic cord to the external abdominal ring. The right testicle and cord were

removed and herniotomy repair performed (Bassini).

All symptoms but the cough disappeared after operation. The cough disappeared at the end of the third week.

BIBLIOGRAPHY

1. Lewis, D. Practice of Surgery. 9: Chapt. xxviii, Phila., 1928.
2. Scudder, C. L. Strangulation of testis by torsion of cord. *Ann. Surg.*, 34: 234, 1901.
3. Keyes, E. L., Jr. Torsion of spermatic cord. *J. Urol.*, 9: 519, 1923.
4. Rigby and Howard. Torsion of testis. *Lancet*, 1: 1415, 1907.
5. Barney, J. D. Torsion of spermatic cord. *Urol. & Cutan. Rev.*, 26: 142, 1922.
6. Campbell, M. F. Torsion of spermatic cord. *Surg. Gynec. Obst.*, 44: 311, 1927.

UNUSUAL FOREIGN BODY IN THE CHEEK

Richard Joseph White, M.D.

FORT WORTH, TEXAS

THE shell of a .22 cartridge in a masseter muscle is, I think, a really unique condition. An eleven-year-old boy was brought to the hospital with a story that three weeks previous in a small town one hundred miles away he had been playing with an old type of single shot breech loading .22 rifle which "broke" in the middle. This was designed for a .22 short cartridge. The boy got hold of some .22 long ammunition and when the cartridge failed to go in completely he held up the open barrel and tried to push it in with a pocket knife. It went off and the bullet lodged in the gun barrel. The shell was thrown back and entered the left cheek a half inch behind the angle of the mouth. Nothing was done for three weeks and most of the swelling had subsided when he was taken to a hospital and an incision was made inside the mouth in an attempt to locate and extract the foreign body.

This failed and I first saw him two days later with a very extensive cellulitis of his left face and some trismus. He was sent home. Mouth irrigations and cold applications were ordered and an analgesic given. He got worse and two days later was admitted to the hospital where the same regime was continued. The second night after admission an abscess burst inside his mouth and the edema and temperature rapidly subsided. An *x*-ray now showed the shell of a .22 long cartridge slightly behind and above the left lower unerupted last molar. Under general anesthesia an external incision was made in the direction of the facial nerve fibers and the parotid duct. The foreign body could not be felt. Confident that it must be near, an incision was made in the masseter muscle and a large cystic spac efilled with sanguinopurulent material was opened. The shell lay in this. It was extracted and the cavity packed to control hemorrhage. The wound was closed with a gauze wick emerging through the skin. At first there was a noticeable muscle weakness about the angle of the mouth, but this has practically disappeared.

The American Journal of Surgery

Editor: THURSTON SCOTT WELTON, M.D., F.A.C.S., NEW YORK

Editor, Department of Radiology: JAMES T. CASE, M.D., F.A.C.S., CHICAGO

EDITORIAL BOARD

WALTER C. ALVAREZ, *Rochester, Minn.*; WM. S. BAER, *Balt.*; DONALD C. BALFOUR, *Rochester, Minn.*; CARL BECK, *Chicago*; ALEXIS CARREL, *N.Y.*; ROBERT C. COFFEY, *Portland, Ore.*; ISIDORE COHN, *N.O.*; W. B. COLEY, *N. Y.*; GEORGE W. CRILE, *Clev.*; ROBERT V. DAY, *Los Angeles*; PAOLO DE VECCHI, *N. Y.*; CHARLES A. ELSBERG, *N. Y.*; C. R. G. FORRESTER, *Chicago*; JOHN H. GIBBON, *Phila.*; DONALD GUTHRIE, *Sayre, Pa.*; A. E. HERTZLER, *Kansas City*; C. GORDON HEYD, *N. Y.*; JAMES M. HITZROT, *N. Y.*; EMILE F. HOLMAN, *San Francisco*; REGINALD H. JACKSON, *Madison*; WM. L. KELLER, *Washington*; HOWARD A. KELLY, *Baltimore*; A. V. S. LAMBERT, *N. Y.*; SOUTHGATE LEIGH, *Norfolk*; H. H. M. LYLE, *N. Y.*; JEROME M. LYNCH, *N. Y.*; URBAN MAES, *N. O.*; ROY D. MCCLURE, *Detroit*; J. TATE MASON, *Seattle*; RUDOLPH MATAS, *N. O.*; H. C. NAFFZIGER, *San Francisco*; F. R. PACKARD, *Phila.*; JOHN O. POLAK, *Brooklyn*; E. H. POOL, *N. Y.*; DOUGLAS QUICK, *N. Y.*; HUBERT A. ROYSTER, *Raleigh*; A. C. SCOTT, *Temple, Texas*; M. G. SEELIG, *St. Louis*; J. BENTLEY SQUIER, *N. Y.*; JOHN E. SUMMERS, *Omaha*; J. M. WAINWRIGHT, *Scranton*; F. C. WARNSHUIS, *Grand Rapids*; ALLEN O. WHIPPLE, *N. Y.*; J. HOMER WOOLSEY, *San Francisco*.

Foreign Collaborators—GREAT BRITAIN—J. JOHNSTON ABRAHAM, *London*; E. F. FINCH, *Sheffield*; ANDREW FULLERTON, *Belfast*; BASIL HUGHES, *Bradford*; GEOFFREY JEFFERSON, *Manchester*; SIR ROBERT JONES, *Liverpool*; R. E. KELLY, *Liverpool*; G. P. MILLS, *Birmingham*; C. MAX PAGE, *London*; S. S. PRINGLE, *Dublin*; J. J. M. SHAW, *Edinburgh*; H. S. SOUTTAR, *London*; J. H. WATSON, *Burnley*.
FRANCE—G. JEANNENEY, *Bordeaux*. ITALY—RAFFAELE BASTIANELLI, *Rome*.

The American Journal of Surgery is truly independent and enters into no "entangling alliances." It publishes many papers read before the leading surgical societies of the Country, but it is *not* "the official organ" of any organization. Every manuscript is selected by the editors, as worthy of publication—nothing is published merely because "it was read at the meeting."

EDITORIALS

POST-GRADUATE EDUCATION

IT is that of a layman, purely, my interest in post-graduate medicine. An informed layman, perhaps, since as Commissioner of Public Welfare in the largest American city for eleven years, and as Controller of the same city for four years, I have been brought into close contact with hospitals, private and public, and with the physicians employed in and attending them. But my point of view is that of a layman primarily, of the fellow who is to be treated and not the fellow who is to treat such ailments as may afflict my body and bones. I want to be sure that my doctor knows his business, that he is to treat me, when I suffer from some of the ills that afflict mankind, as a sufferer whose pains are to be mitigated, who health is to be restored and not as a specimen from which he may learn something about pathology. In other words I want the doctor to know his job before he starts to work on it. Now, after a long and ripe experience, I want to join in a program that would give physicians the opportunity of obtaining such experience and knowledge.

It is quite natural, I suppose, that a young licentiate in medicine should desire to capitalize his knowledge as soon as possible. He has spent his years at preparatory schools and his college of medicine. He has heard his professors, attended his clinics, read his books. He has passed all his exams. He has his certificate as a doctor of medicine. He has the state license to practice. Let's go!

But every experienced physician knows

that as soon as one confronts life he finds conditions of which he never heard in his school, or which seem to him so entirely different in fact, from his academic conception of them that they call on him for original thought which should be guided by a profound and varied contact with facts. What chance has the young fellow who has his doctorial degree fresh in his consciousness and no post-graduate experience and who goes out to practice? He may go to the country where there are few hospitals, or none. He may have to learn at the cost of patients, something which he will regret deeply if he be the right kind of a man under the right kind of a doctor. He will learn, of course, but slowly. Medicine may in its rapid progress get entirely beyond him and he may become an old fogy, a frustrated man, and even descend to a form of quackery all the more offensive because he has the license of the state to practice and the knowledge that the earth will cover his mistakes.

When I was Controller, it was my business to look after the finances of the City's public hospitals, and then I found that experience as internes in these hospitals and as staff attendants was desired by most young doctors. The most ambitious minds sought them from our own city and from the whole nation. I found that Bellevue was aiding the city medical schools. Later when I became Commissioner of Public Welfare, operating directly 15,000 beds of all kinds, this phase of city hospital work became to me more apparent and most important. In view of the problems of post-graduate needs in medicine which constant contact with the members of the Committee on Public Health Relations of the New York Academy of Medicine, eminent local doctors and the leaders of the American Medical Association, the American College of Surgeons and the American Hospital Association, impressed on my mind, I felt that a vast amount of medical material in many of the great institutions of the city was going to waste, and that this waste was at the expense of the patient. From this, I became convinced that hospitals connected with medical education gave the sick the best attention. I tried to meet this. I started post-graduate lectures and clinics in the great Kings' County group in Brooklyn, and in the Metropolitan Hospital cooperated with Flower College in a rather complete course, which the College considers to be most successful. I did my best to start them in every one of our hospitals. I tried to get a vast pathological laboratory constructed at Kings' County Hospital and a liaison established between that group and the Long Island College Hospital Medical School, but—well, there are politics in medicine as well as outside, and my efforts were nullified by unfortunate circumstances. However, my interest in post-graduate medical work is still keen and I do hope that the time will come when all the great city hospitals, public and private, will aid in making the young graduate in medicine a better man for his job of aiding suffering humanity.

I want to be of service, not alone in extending greater facilities for post-graduate work in the City of New York, but in other great medical centers of our country. There are many liberal and broad-minded men and women in rural or semi-rural communities who could not do a better turn for their neighbors and themselves, than by financing the post-graduate education of doctors that are treating and attending them. I have talked with many of the most able and conscientious of the hundreds of internes seeking to learn the reason of their aversion of residing in well-paying rural or even fairly large towns. The answer of almost all was that this would bury them and that they could not keep in touch with their profession. For the benefit of the health and lives of our people, I hope that the American Journal of Surgery can start and carry through a discussion, out of which we can get together and form a plan that will bring the doctor from even the outpost of civili-

zation, in touch with the latest progress in medicine and surgery.

Bird S. Coler.
Former Commissioner Public Welfare,
City of New York.

[This communication is worthy of unusual consideration, as it gives a lay viewpoint of an important phase of Medical Education by a man who is recognized as an expert on such matters, because of his long experience as the governing head of The City Hospitals of greater New York. ED.]

GONORRHEA: A CRITIQUE*

DURING the last few years I have written and talked so much about the laboratory and clinical phases of gonorrhea that I have not the courage to bore you further with them. For this reason, and the fact that of late my mind has been turned more constantly in that direction, I have chosen to discuss the broader aspects of the matter, the relation of the disease to mankind at large and the profession of medicine in particular; to sketch conditions frankly as I think they are and to try to point out some things that must be done if the present unattractive picture is to be changed for the better. If, at times, the criticisms seem destructive I am going to ask you to bear with me for there is no wish to be offensive or unkind. At times the frankness may seem harsh but time does not permit of dressing each thought in honeyed words to soften the blow, even were it in my power to do so. The plain, blunt statement of a fact usually is more arresting and there is no subject in all of medicine in which plain talking is more needed.

That you may immediately sense the the importance of the disease I shall briefly outline a few estimates of its prevalence. This would seem unnecessary to such an audience but I doubt if any of us fully realize what the disease is doing. You may question the accuracy of the figures given and they will not suffer greatly if you cut them in half.

It is estimated that from 60 to 90 per cent of all males in large cities have gonorrhea at some time during their lives; that 20 per cent of all married men contract the disease at some time during their married lives and of these 45 per cent infect their wives; that from 40 to 60 per cent of all operations on the uterus and its adnexa are thus occasioned; that gonorrhea accounts for at least 5 per cent of all blindness. Added to this is a sum total of human misery that is staggering and, last, but perhaps not least, is an economic loss that runs into millions of dollars.

If these estimates do not strike you let me quote a few figures given in Dr. Haven Emerson's report after an exhaustive health survey of my own city, a city that I think you will agree with me is as clean as any city in the country having more than half a million people. Dr. Emerson estimated that we develop more than 159,000 new cases of gonorrhea and syphilis annually and that the incidence of gonorrhea is at least five times as great as that of syphilis. Let me go further with his figures, and remember that these figures are not idle guesses but represent months of the most careful investigation of the question from almost every angle at cost of many thousands of dollars.

He found that 45,800 of these cases are treated by recognized medical agencies and at least 114,000 have no trained medical supervision whatever. It is further brought out that 33.3 per cent of our druggists admit that they treat these

* Read before the New York Academy of Medicine, Section of Genito-Urinary Surgery, October 16, 1929.

diseases, though it is directly against the law of the commonwealth, 23.2 per cent of them refuse to commit themselves on the subject and 43.5 per cent say they send such patients to physicians or clinics. It was not possible to learn or to estimate how many were treated by quacks and charlatans. When the inquiry as to what they would do if they had a veneral disease was made of 100 individuals chosen at random in pool rooms, barber shops and other public places, a rather surprising state of affairs was shown to exist. Forty-two per cent said they would consult a druggist, 24 per cent a physician, 16 per cent a clinic, 4 per cent would use a home remedy and 14 per cent did not know what they would do.

Surely, as guardians of the public health, we have much food for thought in these figures. We cannot appease self-conceit by calling them merely local and an expression of what you are facetiously pleased to call Philadelphia somnolence. Similar conditions are being demonstrated in each of our large cities and certainly the reporting of 159,000 cases of the venereal diseases each year, in a city of 2,000,000 inhabitants, would seem to brand us as rather wide awake. No one has ever thought that the medical profession of my city is asleep, as the record throughout the years has shown it to be rather an alert body.

Let us make no mistake about it. The above conditions are national and they cry so loudly for correction that it behooves us to give them the most serious consideration. Obviously something is radically wrong when so large a proportion of that great group of diseased individuals does not even choose to consult us. The business man would call it wretched salesmanship but the fact is, insofar as gonorrhea is concerned, and most of these cases are gonorrhea, we have not even tried to sell anything. In this regard we have drifted so long that I fear the fault has become public property and in the eyes of the social-minded our profession is definitely on the defensive. This we perhaps would do well to admit. Faults are rarely corrected until they are admitted.

Insofar as we are concerned, wherein lies the fault? Unquestionably our greatest fault in regards to gonorrhea has been a most unfortunate lack of medical interest in it and its victims. We have been so busy thinking of more attractive things that we have allowed this one to drift along bearing the heavy mosses of other years. One might appropriately borrow a term from the sociologists and call our present position one of the "Costs of Progress," for every human gain is made at some cost.

Twenty years ago we knew almost as much about gonorrhea as we do today and very few doctors thought it beneath their dignity to treat it. Some even specialized in it and called themselves genito-urinary specialists. Then some grew rather proud for such a name and the designation urologist was adopted. This was perhaps in the line of progress; but, as it grew in dignity, it grew to mean bigger and bigger things and, though it still embraced the smaller things, it gave them scant attention. There was formed a national association of urologists and about fifteen years ago this body took great pride in the fact that it put across an annual program without any papers upon the so-called venereal diseases. One cannot severely criticise this, however, for the papers on venereal diseases were of a type, as a rule, that should not have been presented before such a body.

Much of our urological progress has been due to the stimulus to scientific work given by the American Urological Association and today American urology commands the respect of the world. The lure of surgical urology, however, has relegated gonorrhea to a place of obscurity and many urologists have grown so proud that they hesitate to admit that they treat such a lowly disease; in fact, some even deny it. Surely we have progressed at a terrible human cost.

Gonorrhea either belongs to the realm of Urology or it does not. We all feel that it does and perhaps it would have fared better if our National Association had exhibited more tolerance and encouraged thought upon the subject by patiently listening to a few papers on it each year. Certainly nothing that afflicts the human race is too lowly for the physician to consider, and if we find ourselves growing too proud over our remarkable progress we can find ample reason for humility in the contemplation of that vast horde of afflicted that do not even "choose to run" in our direction but prefer the druggist and the charlatan.

Turning, then, to a consideration of things as they are, we find ourselves faced by a number of perplexing conditions that are by no means easy to surmount. We find an awakening interest upon the part of our profession on the one hand and a public that is in no sense social disease-minded on the other, all influenced by a public press giving columns to love and its roses and not daring to mention the name gonorrhea, its greatest thorn. We find genitourinary dispensaries in most of our hospitals occupying quarters that no one else wants; woefully inadequate for the numbers of patients visiting them; lacking in any possibility for privacy; so poorly manned as to compel herd treatment for the most individualistic of all diseases and totally out of sympathy with the governing boards of the hospitals, not because they dislike the staff but because they loathe the diseases treated by them.

Scientifically we are faced with an even more unfortunate state of affairs and, if we are to be honest in our analysis of what we know or do not know, we are forced to make some painful admissions. Let us make the great one first. We know little more about the disease and its treatment than we did twenty years ago and much of what we think we know will not bear too close a scrutiny. In fact there is a crying need for an entire restudy of the disease to the end that we may discard the huge mass of misinformation that has accumulated about it. Much of what passes for science in this regard is not even good pseudo-science; often it is ridiculously erroneous. We could abandon with profit much of what we think we know about the gonococcus, for an enormous amount of it is simply not true. Our knowledge of the microscopic pathology of the disease has had little if anything added to it in thirty years. What we style "knowledge" of the immunologic aspects is a mass of contradictions. We have little knowledge of the true curative processes except that patients do get well; but we do not know how or why. When we view the clinical side of the question we encounter a maze of confusion with little uniformity of opinion or belief. And, when at least we turn our thoughts toward cure, we find ourselves in a veritable ocean of dreams. It looks as if we have neither rudder nor compass to our ship, and though we may know where port is, we often choose weird and windswept courses to reach it.

It is a great misfortune that a disease that afflicts such a large proportion of the human race should exhibit, perhaps, the most delicate immunity-balance of all diseases, for it is this feature of it that gives us our crowning perplexity. So adversely influenced is the disease by seemingly innocent things that we have always been hampered by its clinical vagaries in our efforts to evaluate properly our plans of treatment. It is only when the personal conduct of the patient is above reproach that one may differentiate surely between patient-faults and treatment-faults. Occurring as it does most commonly in those years of life when desires are strong and inhibitions halting, it is natural that it should have seemed so impossible of classification, with variations as numerous as the cases. And because of these things we have almost an endless number of plans of treatment and perhaps none of them has ever had what might be called a

scientific, well-controlled trial. Wherefore, there is urgent need for an entire restudy of these methods carried out upon patients where they are under constant observation and cared for by deeply interested physicians really familiar with the disease and the things that so quickly change the clinical picture. Lacking generally the facilities for hospitalization of gonorrheal cases, it would seem that the various branches of the governmental service, where large numbers of such patients can be readily restrained as to certain activities, might find a valuable work waiting at their doors.

So much for some of our perplexities. What are the modern trends of thought and action? One only has to question a few of that increasingly numerous group of social-minded individuals who spend their lives on the borderline between the doctor and the afflicted, to learn that they are keenly alive to the great need for action regarding the prevention and better treatment of the so-called "social diseases." Governmental agencies and social agencies within the last few years have been awakened as never before (except, perhaps, during the World War), are treading upon our heels and, unless we respond, we shall be pushed aside by the great demand for action.

We dread big business in medicine and, in this regard, we offer a golden opportunity for its entrance. Unless we as a body give the matter earnest attention we shall have duplicated in every large community just what has taken place in our second largest city. There has been built up in it an enormous institution doing, in its own way, and in competition with our profession, a thing we have failed so completely to do. And, though we may call its methods unethical and doubt the wisdom of some of the things it does, the fact remains that it is in its way filling a public need that we have allowed to arise. If it were not filling such a need it could not have the sponsors that it has. They are too wise in the way of business to sponsor a needless thing.

It is becoming increasingly simple to interest individuals of great wealth in this phase of medicine and I am given to understand that even now one of the great "foundations" has given a kindly ear to the question. An institution in a neighboring city has been given a large fund and I am told that the venereal problem had much to do with it. I am further informed that your own city has been surveyed with this thought in mind and that the only reason why you have not an enormous institution for the treatment of these diseases, working in financial competition with you, is that you have a peculiar state law that curtails its publicity efforts. If this is true, it might be well for a committee chosen from your numbers to watch that law until such time as you so change present conditions as to make such a step on the part of big business unprofitable. Unquestionably this is the "handwriting on the wall" and, if we would save the situation we must put away petty feelings and work in harmony, for, if these things happen in one field of medicine, none will be immune against them.

If, on the other hand, an abounding humanitarianism makes us feel that as an individual, the physician has served his purpose and that the human race will be far better off when most of us seek other fields and the rest of us become cogs in some great medical institution which sells our services to whoever comes to buy, we have only to sit and wait. Wealth has scant regard for what we call medical ethics and is not willing that it should stand between us and public service.

What shall we do about it all? Apparently we have lost or have never had the confidence of an enormous number among our population. The rather obvious reasons for some of this have been previously discussed. When a business finds itself in such a predicament it tries to improve its product and it goes after

customers, from both of which moves we might learn. Certainly we must improve our product and just as certainly some form of dignified, ethical and concerted effort should be carried out to make our communities venereal disease-minded, for, unless the public is aware of the great menace of these diseases, we can hope for little in the way of greatly reducing their prevalence. With countless numbers of infected individuals throughout the land being "treated" by the druggist and the quack without any medical supervision whatever; with a medical profession not altogether alert to the seriousness of the problem; with a knowledge of the disease that has not yet reached a stage wherein there is much uniformity of procedure, a knowledge often unfortunate in the survival of treatment plans that could only prolong the infection, unquestionably we have much ground to cover.

Let us discard that sense of pseudo-niceness that makes some of us too proud to admit that we treat such a disease. If we cannot arouse an interest in the disease and in its victims, sufficiently great to make us willing to carry out the required procedures, let us be honest and not treat it at all. It is too serious a disease for makeshifts in treatment.

By the nature of things most of the preventive work must of necessity fall upon our shoulders. It must rest on the proper care of the disease when present, the proper control of those afflicted and the proper instruction of those patients whom we think we have carried on to a cure. Without the cooperation of the diseased, our efforts at cure and prevention must come to naught, and without a kindly attitude toward them we cannot gain that cooperation.

We must strive to make a better type of treatment available to the poor under conditions of privacy more nearly approaching that afforded our office patients. To do this we must entirely revise the common dispensary methods. The usual genitourinary dispensary is a gloomy, ill-fitted place having so few physicians in attendance that the order of the day must be the greatest good to the greatest number, with privacy and individual encouragement for none. Until we can correct these conditions universally we encourage commercial exploitation of the poor.

We must in our dispensaries, at least, cooperate with the established social service agencies, for, no matter how much we may question their former activities, the fact remains that today they are, by and large, a body of specially trained individuals and without their help a genitourinary dispensary can only haltingly fulfill its great purpose.

In bringing about a general change in dispensary methods we are sure to encounter some great difficulties. We must start by convincing the hospital governing boards that they are necessary. We must make the case so strong that funds will be forthcoming to effect the necessary changes in physical equipment or we must find the funds, a thing not so difficult today as it would have been a few years ago. The data obtained by the United States Public Health Service and the American Social Hygiene Association in their various surveys give a wealth of convincing argument.

As the quickest way to bring about such an improvement and perhaps in a measure force the hand of those hospitals unwilling to join the march of progress, the suggestion has been made and, if properly carried out, I see no great fault in it, that each large city have at least one independent, model clinic for the proper treatment of venereal diseases among the poor. Such institutions should be started by the physicians and not by the laity. There should be on the governing board physicians of the highest type who have nothing to gain financially by the association. There should be associated with them laymen of such outstanding position that they have nothing to gain beyond the mental satisfaction of things done in a

worthy cause. Such a clinic should be run in cooperation with the physicians and existing hospital dispensaries, and never in competition with them, and the medical members of such a board should at all times see that nothing of a harmful and unethical nature is allowed. These centrally located institutions should have every patient interviewed by a social service registrar and should refuse to treat any patient who is financially able to pay a physician's fee. It is only by so doing that they can obtain and hold a kindly place in the scheme of things. Such a clinic should in every way strive to serve as a model to the end that existing institutions will be glad to copy its methods and it should be willing to discontinue the treatment of patients just so soon as it can be shown that existing hospital dispensaries have reached a plane rendering the model dispensary no longer necessary. The governing board, however, should continue to function as an educational medium for the public, for unless a community can be made and kept venereal disease-minded, it will soon sink back into the position from which it was only temporarily raised.

If, as is possible, you disagree with the idea of a model central clinic not belonging to any hospital but to all, you must of necessity face the evils of present conditions insofar as the treatment of the poor is concerned. These evils are glaring ones and they will not find correction until we show a lively interest in them. As has been said, the usual genitourinary dispensary is a dreary place wherein large numbers of patients must be treated by none too interested physicians while, what seems to be the world, looks on. There is neither the thought nor the possibility of privacy. Because of the number of patients and the scarcity of men willing to treat them, oral medication, in which few, if any, seriously believe, is the most common treatment. If local treatments are the order of the day they usually must be carried out by the patient himself and their train of disabling complications usually is just what should be expected. The proper treatment of these patients in large groups is tedious and tiresome and until we find a way to remunerate the men who do it, we shall hardly correct conditions. Regret it as we may, the age of long apprenticeships in medicine has passed and our younger men cannot financially afford to treat the same things month after month unless it in some way yields an economic return.

There are, of course, many other phases of this important subject that might be dwelt upon with both interest and profit. It, however, would be kinder not to try your patience by prolonging the discussion further. It has not been my desire to be offensively critical; I have only wished to make you see conditions as they have grown to be and I cherish the hope that I may have been able to stimulate an interest in you that will transcend any hesitancy you may have had regarding this social outcast, gonorrhea, to the end that you may individually and collectively give earnest attention to the treatment and prevention of what well might be called "The Fourth Great Plague."

P. S. Pelouze, M.D.

NOTICE

When the Radiological Department was added to this Journal, it was assumed as a matter of course that the articles on radiology should be collected together under the general heading Department of Radiology. However, on reflection it does not appear that there is any good reason why these articles should be so segregated. In many instances it is really difficult to decide whether a communication should be classed under the head of surgery or under radiology, although it contains radiological data and observations of great importance. Swick's paper on Intravenous Urography, published in theF ebruary number, is a radiological article of greatest impor-

tance, yet of greatest importance to surgeons; and it really deserved a more prominent place in that issue of the Journal.

So while the Radiological Department will be continued as before, beginning with this issue there will be no special heading, but the articles will be scattered through the Journal as all other articles are, there being no particular reason for having a special heading for these when there is none for other subjects.

INTERNATIONAL SOCIETY OF ORTHOPAEDIC SURGERY

AT A meeting of the Executive Committee of the International Society of Orthopaedic Surgery, held in London, February 1st, the following members were present: Sir Robert Jones of Liverpool, President; Prof. V. Putti of Bologna, Second Vice President: Dr. J. Delchef of Brussels, General Secretary; Prof. M. Maffei of Brussels, Treasurer; and Mr. Fairbank of London. At the suggestion of the French and German committees it was decided to propose at the next general assembly an increase in the membership of the Society. The next Congress of the Society will be held in Paris, October 2–4, 1930.

As a part of the program there will be two symposia. The first will be on the subject "Treatment of Congenital Dislocation of the Hip after the age of fifteen Years." Reporters will be chosen from the United States, Germany, Great Britain and Italy. The second symposium will be on "The Treatment of Wrist Injuries" and reporters will be selected from France, Holland and Sweden.

The American committee is composed of Fred H. Albee, Chairman, William S. Baer and Henry W. Meyerding.

SAMUEL D. GROSS PRIZE

THE Samuel D. Gross Prize of the Philadelphia Academy of Surgery has been awarded by the Trustees to Dr. Emile Holman, Stanford University Hospital, San Francisco, for his Essay upon "Abnormal Arteriovenous Communications."

CORRECTION

IN the article on "Radiological Demonstrations of Pleurisy in Children" by Dr. E. Gordon Stoloff in the March Journal, the caption under Figure 7 should have appeared under Figure 9, that under Figure 8 under Figure 7 and the caption under Figure 9 should have been under Figure 8.

In the April issue the cuts on pages 852 and 853 were interchanged. The legends are alike.

Subscribers to THE AMERICAN JOURNAL OF SURGERY *visiting New York City are invited to make the office of the publishers (Paul B. Hoeber, Inc., 76 Fifth Avenue, New York) their headquarters. Mail, packages or bundles may be addressed in our care. Hotel reservations will gladly be made for those advising us in advance; kindly notify us in detail as to requirements and prices. List of operations in New York hospitals on file in our office daily.*

JOHANN VON MIKULICZ-RADECKI

[1850-1905]

The American Journal of Surgery
N. S. Vol. VIII, May, 1930

"MIKULICZ'S DRAIN"

JUNE of this year commemorates the twenty-fifth anniversary of the death of Johann von Mikulicz-Radecki, one of the greatest of the Continental surgeons who entered the stage prior to the age of Listerism and who lived to see surgery safely launched in the 20th century. Truly, he was a surgical giant and much of his work endures, without change, till this day.

Mikulicz was born in 1850 at Cernowicz, then in Austria. He received a liberal and thorough education at Herrmannstadt, and in 1875 was awarded the degree of doctor of medicine at Wien.

Almost immediately after graduation he entered Billroth's clinic and for six years was his assistant. From his assistantship to Billroth he went to Krakaw, where he became director and professor of surgery at the University. He continued in this position until 1888 when he was called to Königsburg to become the Director of the Clinic and Professor of Surgery. In 1890 he became professor of surgery at Breslau, which position he held until he died.

Mikulicz was a real surgeon, viewed from every angle. He had a surgical background, was a skillful technician, was unexcelled in the arts of diagnosis. His mind was of the inventive type, and he devised many new operative procedures. He was a teacher who knew how to impart knowledge to others. He did much to improve antiseptic surgery. It was he who devised the present modes of exploring the esophagus and the stomach. He was the first to treat cancer of the esophagus by resection and plastic transplantation. He introduced lateral pharyngotomy in excising malignant tumors of the tonsillar region. He was the first to use non-specific protein injections for septic conditions of the intra-abdominal and pelvic organs. He did not know the rationale of this treatment but he observed that sometimes the patients improved clinically. He described the symmetrical inflammation of the lacrimal and salivary glands, which disease bears his name. He opened up new fields in gastric and joint surgery and devised several new operations. The operation for malignancy of the colon is named after him, as is the drain still commonly used in conditions of the abdominal cavity. He was the first to give the law that in thyroidectomy some of the gland must be left. In 1892 he collaborated in an atlas and in 1898 on a treatise on diseases of the mouth. He was one of the first to wear gloves in operative work. However, the gloves were of cotton, Halstead in America was the first to employ gloves of rubber.

Mikulicz was an accomplished musician. He earned his way through the university by money received for playing an organ from 5 until 8 A.M. He continued his musical enthusiasm throughout his life. He was a great friend of Brahms.

He had eight children, four sons and four daughters. All of his sons died except Prof. Dr. Felix von Mikulicz-Radecki of the University Frauenklinik of Berlin, who visited this country this spring and gave the writer many of the facts given here.

It is a coincidence that, having done so much operative work for the relief or cure of intestinal cancer, he should contract a malignancy of the stomach and undergo an operation from which he died, leaving a name known to surgery in every civilized country of the world, when but fifty-five years of age.

T. S. W.

[From Fernelius' Universa Medicina, Geneva, 1679.]

BOOKSHELF BROWSING

SURGICAL INSTRUMENTS OF THE ELLICE ISLANDS*

DONALD GILBERT KENNEDY, F.R.G.S.

VAITUPU, ELLICE ISLANDS, SOUTH SEAS

THE implements of primitive peoples have a fascination for the investigator. Sometimes one finds a specimen which is obviously the embryo from which has evolved one of our own highly specialized tools, but more often the examples are primitive collaterals developed from the material at hand to serve a purpose probably similar to that for which the first ancestors of our own implements came into being. The lancets herein illustrated are a good example of this type.

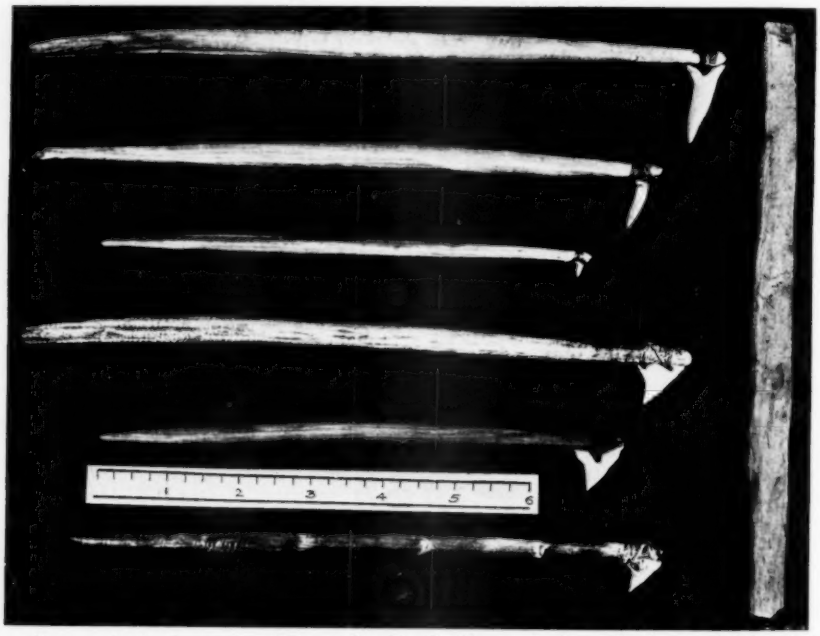


FIG. 1. Tapping mallet and six lancets collected by D. G. Kennedy from Vaitupu, Ellice Islands. These have been presented to Otago University Museum, Otago, N. Z.

Throughout the islands of the Pacific the use of metals was unknown. Cutting edges were obtained from whatever ma-

* Submitted for publication, January 8, 1930.

terial was available. In the high or volcanic islands, we find knives made from obsidian. Where bamboo was available its keen edge, when split and trimmed to the shape required, was found useful for cutting material softer than itself. Thus, in surgical operations, the lancet was frequently fashioned from bamboo

In the low islands, however, the true coral atolls, such as those of the Gilbert and Ellice Groups, the bamboo does not grow and volcanic stones are absent. One might sift the soil from end to end of each one of the twenty-five atolls in these groups without finding a trace of obsidian, flint, basalt, or any pebble or grain of sand for that matter, which is not a fragment of sea shell, sea-borne pumice or coral.

Adzes were made from fragments of the shells of large bivalves while flimsy axes for hacking off green cocoanut leaves were fashioned from sections of turtle's carapace. The edges which could be given to these materials, however, while suitable, with frequent regrinding, for adzing and chopping, were quite useless for cutting knife-fashion.

The making of incisions in surgery therefore demanded a new material and this was found in the razor-edged teeth of certain species of sharks.

The method of fashioning these primitive lancets is shown sufficiently well in the accompanying illustrations of specimens which were collected by the writer on Vaitupu, one of the Ellice Islands. Those shown in Figure 1 have been presented by the writer to the Otago University Museum, Otago, New Zealand. In Figure 1 are shown a tapping mallet, three lancets made of short, wide, shark's teeth and three of long narrow ones. Their uses will now be described.

In order to make an incision, the wooden handle was held in the operator's left hand and the point of the tooth placed lightly on the region to be incised. A sharp blow was then delivered on the handle just behind the lashing threads with the wooden mallet held by the operator in his right hand. The tooth was thus driven into the tissue making a clean and free incision.

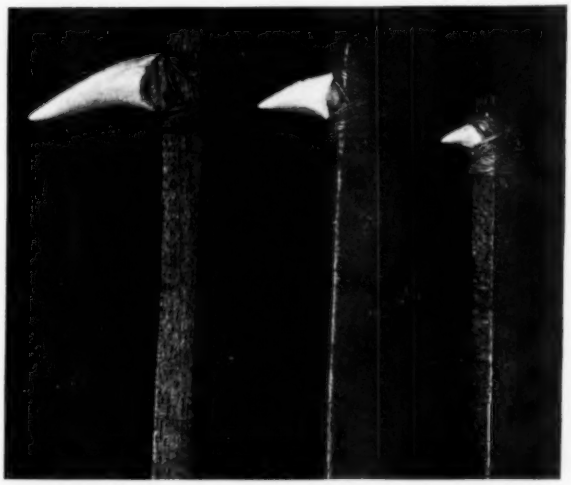


Fig. 2. Three lancets from Vaitupu, Ellice Islands, presented to Dr. E. W. Gudger, American Museum of Natural History.

When a long incision was required, a wide based tooth was selected (see Fig. 1, lower half). The handle was held at such an angle to the surface to be incised that when it was tapped with the mallet, only the front edge of the tooth (if that edge towards the handle is called "back") cut into the tissue. The instrument was moved forward along the line of incision being tapped with the mallet and leaving a clean cut in its wake.

Teeth of various shapes were used for different purposes and a *tufunga* (master) of this particular craft had always in his house at least one instrument of each variety. The particular purpose of the broad flat type has already been indicated.

The long type illustrated in Figure 1 was capable of making a deep narrow incision and was used for opening abscesses. The small variety shown in Figure 1, upper half, was used for blood-letting. Headache was often treated in this way, the skin being pricked at close intervals with the needle-like point tapped rapidly with the mallet as it was moved over the area of pain.

The instruments are rarely, if ever, used at the present day, the evidence of their

use, given above, being received at first hand from two old-time *tufunga*.

In reference to the making of long incisions mentioned above, in connection with the use of the broad flat tooth, it may be of interest to record an operation in which this was often required. This was the removal of a subcutaneous lipoma.

An incision was made over the tumour with the shark-tooth lancet. A fish hook was then inserted into the lipoma and the line to which this was attached was given a steady strain by an assistant while the surgeon cut away the connecting tissues until the tumour was free. Blood was removed by another assistant who applied his mouth to the wound between strokes of the lancet.

Figure 2, a photograph of three lancets in natural size, shows in greater detail the teeth and their method of attachment (lashing) to the handle. These lancets and a tapping mallet were presented by the writer to Dr. E. W. Gudger of the American Museum of Natural History, New York City. The mallet and one lancet have been deposited in the ethnological collections of the Museum.

BOOK REVIEWS

RADIUM IN GENERAL PRACTICE. By A. James Larkin, B.SC., M.D., D.N.B., 28 illus., N. Y., Paul B. Hoeber, 1928.

In this age when many physicians have a more or less vague and disjointed conception of the indications for, and technic of the use of, radium, a book on the subject written so one need not be a super-physicist is more than welcome.

Dr. Larkin has written a book that every physician who meets with patients who may need radium applications to improve or cure their disease, or patients the physician decide to apply radium to, should carefully read.

After a preface the book is divided into five parts. Part I takes up General Considerations. Under this chapter heading the author considers the mechanics of radium, biologic reactions, methods of application in general, general technic, contraindications to radium treatment and dangers of radium application. This chapter alone is worth the cost of many works written casually on the subject.

Part II deals with General Diseases; Part III with Gynecological Diseases. Inasmuch as the modern gynecologist has occasion to employ radium in his work, cervical cancer being treated by many with radium and not by surgery, we urge the gynecologist to study this chapter; Part IV is devoted to Miscellaneous Tumors and Carcinomata; Part V, Miscellaneous and Skin Lesions, a chapter we recommend to every surgeon and dermatologist.

There is a complete Index. All in all it is an excellent, authoratative and timely book on a subject close to the majority of the doctors of medicine.

VARICOSE VEINS with Special Reference to the Injection Treatment. Ed. 2, rev. & enl. By H. O. McPheeters, M.D., F.A.C.S. 235 pp., illus. with half-tone and line engravings. Phila., F. A. Davis Co., 1930.

The first edition of this book was sold out in five months, an indication that it surely answers a definite need. The author has revised Chapter V on "The Trendelenburg Test" which, according to his Preface, was thought not to be detailed enough in the first edition. It is a well printed book that deserves the success it has achieved.

A TEXT-BOOK ON ORTHOPEDIC SURGERY. By Willis C. Campbell, M.D., F.A.C.S. 705 pp., 507 illus. Phila., Saunders, 1930.

Another textbook on orthopedic surgery, well written, well printed and well illustrated and covering the ground in fairly complete fashion in 705 pages. As the author admits in his Preface: "Our knowledge at the present time is far from complete, and as additional information is acquired our opinion on many subjects will probably be altered." "However," says he, "an attempt has been made to give a sufficiently comprehensive classification, especially of infections of joints, bones, and tumors, to afford a clearer exposition of the more complex subjects. . . No attempt has been made to describe all known methods of treatment, but only those which, in the judgment and experience of the author, are considered to be of practical value. The essentials of modern operative methods are defined, and in many instances the technic described for a better understanding of these principles."

In this attempt the author has been success-

ful. We look for improved and enlarged reprints for many years to come.

Practical Massage and Corrective Exercises with Applied Anatomy. By Hartvig Nissen. Ed. 5, Revised and Enlarged by Harry Nissen. 271 pp., 72 illus. Phila., F. A. Davis, 1929.

This is the fifth edition of a work first published in 1889. It is, as its title indicates, strictly limited to practical massage, and it lives up to its title very well indeed. It is refreshing to see a work on any phase of physiotherapy that does not entail the expenditure of thousands of dollars for apparatus. In the opinion of the reviewer much of the good of modern physiotherapy can still be attained by the proper use of corrective exercises, and the indication for its proper uses are well stated in this little book.

Applied Physiology. By Samson Wright, M.D., M.R.C.P. With Introduction by Swale Vincent, M.D., LL.D., D.Sc., F.R.S. (Ed. & Canada). Ed. 3. 590 pp., 128 illus. Humphrey Milford, Oxford Univ. Press, 1929.

With the general recognition today that physiology is the foundation stone of modern medicine, there is definite need for a book of this kind. As Dr. Vincent points out in his Introduction: "The day has gone by when a practitioner, however, modest, can afford to declare that 'he has forgotten his physiology.'" This book on applied physiology is much better adapted to the needs of the physician in active practice who wishes to review his physiology, than is the average textbook. It might well be termed the "Practitioner's Physiology."

Getting Well and Staying Well. A Book for Tuberculous Patients, Public Health Nurses, and Doctors. By John Potts, M.D. Introduction by J. B. McKnight, M.D. Ed. 2. 221 pp. St. Louis, C. V. Mosby, 1930.

The sub-title of this volume, "A Book for Tuberculous Patients, Public Health Nurses, and Doctors," really tells the whole story. By putting this book in the hands of tuberculous patients, the doctor may simplify his work. Undoubtedly the average nurse will also profit by its study. The fact that a second edition is called for in three years is evidence that the book answers a definite purpose.

Demonstrations of Physical Signs in Clinical Surgery. Revised and Enlarged. By Hamilton Bailey, F.R.C.S. (Eng.). Ed. 2. 286 Pages, 306 illus., some col. N. Y., Wood, 1930.

The author states, "This book, founded upon demonstrations to fourth-year students, was designed for their use." In spite of this fact, this book should be of great value to the practicing surgeon. The perusal of this book will bring to mind many a little point that has been forgotten and overlooked in active practice. While it is elementary on the face of it, the reading of this book will well repay anyone interested in careful surgical diagnosis.

A Text-book of Psychiatry for Students and Practitioners. By D. K. Henderson, M.D. (Edinb.), F.R.F.P.S. (Glas.) & R. D. Gillespie, M.D. (Glas.), D.P.M. (Lond.) Ed. 2. 536 Pages. Humphrey Milford. Oxford Univ. Press, 1930.

"A Text-Book of Psychiatry" by Dr. Henderson and Dr. Gillespie is dedicated to Adolf Meyer, of Johns Hopkins. It is interesting to note that while the authors are Englishmen, Dr. Henderson being Physician-Superintendent of the Glasgow Royal Mental Hospital and Dr. Gillespie the Physician for Psychological Medicine at Guy's Hospital, London, both of them received their training as psychiatrists in Baltimore.

The book is thorough and up to date. The omission of references to some of the more modern American books is probably an oversight, as the text shows a thorough knowledge of modern literature. It is a comprehensive and authoritative text and reference book. The subject is here authoritatively presented in reasonable format.

Procedure in Examination of the Lungs. With Especial Reference to the Diagnosis of Tuberculosis. By Arthur F. Kraetzer, M.D. With a Foreword by James Alexander Miller, M.D. 139 Pages. N. Y., Oxford Univ. Press, 1930.

Dr. Miller says in the Foreword: "Many of our text-books have made the examination of the chest far too complicated, and Dr. Kraetzer has made a real contribution in simplifying the methods involved." Not everyone will agree with this statement, but Dr. Kraetzer's little book of 125 pages (unfortunately without an Index) thoroughly covers every phase of the examination of the lungs. Anyone feeling that this subject is not sufficiently covered in the average book on physical diagnosis will find this volume of interest and of value. Probably, it is only by the publication of enthusiastic monographs of this nature that the authors of textbooks will find it possible to get their detailed information, and it will then be their job to condense and correlate with other subjects.

The medical student of today has our sympathy if he is expected to read a book on all the phases of diagnoses and treatment on which we older men needed only to read paragraphs or chapters.

THE NERVOUS CHILD. By Hector Charles Cameron, M.A., M.D. (Cantab.), F.R.C.P. (Lond.). Ed. 4. 256 Pages, 8 Plates. Humphrey Milford, Oxford Univ. Press, 1929.

The nervous child is one of the problems of the day and every physician, be he family doctor or surgeon, faces this problem at one time or another. Therefore, the first chapter alone on "Doctors, Mothers and Children" is recommended to the attention of every medical man. This chapter in itself is well worth the price of this book.

PROGRESSIVE MEDICINE. Vol. 1, March, 1930. Phila., Lea & Febiger, 1930.

The quarterly digests of the "advances, discoveries and improvements in the medical and surgical sciences," known to many of the profession under the general title, "Progressive Medicine," are too well known and worth while to need more than a casual introduction.

The latest number (March 1930) continues the high standard of previous issues. Surgery of the head, spinal cord and peripheral nerves is covered by Francis C. Grant; surgery of the thorax, including the breast and goiter, by George P. Muller; infectious diseases, including acute rheumatism, croupous pneumonia and influenza, by H. E. MacDermot; diseases of children, by John P. Caffey; rhinology, laryngology and otology, by John A. Bacher. There is an index.

We do not intend to be hypercritical and discuss every misprint or clouded statement. However, on page 63 occurs a statement which needs correction. It reads, "No discussion of anaesthesia in cranial surgery can be considered complete without reference to the recent work of Koster on the use of spinal anaesthesia . . . the statement of Koster is important that in the last 200 laparotomies which he performed, the entire head and face were rendered insensitive to pain . . ." This probably is a mis-statement. We have looked through Koster's writings and fail to find this statement. But we did read, "In our clinical study of complete body anaesthesia which now number over 750 cases, we have not met with serious cardiac or respiratory embarrassment."

BIOGRAPHISCHES LEXIKON der hervorragenden Ärzte aller Zeiten und Volker. Unter Spezial-Redaktion von Dr. E. Gurlt und Dr. A. Wernich herausgegeben von Dr. August Hirsch. Zweite Auflage durchgesehen und ergänzt von Prof. F. Hübotter, Berlin, und Prof. H. Vierordt, Tübingen. Zweite Bd. Chavet—Gyulay. Mit 64 Bildnissen, 932 Teite. Berlin, Urban & Schwarzenberg, 1930.

The second volume of the new edition of "Hirsch's Biographisches Lexikon" is now before us and runs from "Chavet to Gyulay." Like the first volume it contains much interesting material splendidly arranged.

There are 64 illustrations on 16 plates. We feel it would be better for these portraits to be put right in with the individual biographies, even at the expense of having to use a coated paper for the whole book. If the present method is continued, however, it would seem that it would be well to have a notation at the end of the biography, stating on what page the portrait will be found. As it is now, there is no way of telling from reading the biography whether there is a portrait published and one has to turn to the list of illustrations at the beginning of the volume. This is not a serious matter, but it would seem to be very simple to put in brackets an indication that a portrait has been published.

It is to be hoped that before this set is completed, there will be a geographical list of names. It would be interesting to check up how many men from any special country have done work in medicine worthy of being included in such a work.

We look forward impatiently to the completion of this unique work which is invaluable for historical references.

A CLINICAL STUDY OF THE ABDOMINAL CAVITY AND PERITONEUM

EDWARD M. LIVINGSTON, M.D.

PUBLISHED SERIALLY IN

The American Journal of Surgery

FIFTH INSTALLMENT
CONTENTS

[This Number]

	Page	A. J. S. Page
SECTION I. THE CAVITY (CONTINUED)	178	1110
E. Intraperitoneal Fluids (CONTINUED)	178	1110
F. Pressure Variations within the Abdomen	195	1127
Eponym	220	1152
Questionnaire	226	1158
References	229	1161

[Previously Issued]

INTRODUCTION	1	195
SECTION I. THE CAVITY	6	200, 460, 695, 912

[In the following pages the Journal page number will be found at the bottom of the page.]

A CLINICAL STUDY OF THE ABDOMINAL CAVITY AND PERITONEUM

Section 1. The Cavity

E. Intraperitoneal Fluids (*Continued*)*

5. Differentiating Free Intraperitoneal Fluids. Free fluids give rise to such conditions as ascites, hemoperitoneum, bile peritonitis, chylous peritonitis, urinary extravasations; and as the various liquids spread over the peritoneal membrane or accumulate to distend the abdomen, each produces a quite distinctive clinical picture.

a. Hemoperitoneum. With free blood, the clinical picture is composite in character; there is combined evidence of acute anemia, shock, and free intraperitoneal fluid. Among the signs and symptoms are pallor, syncope, thirst, air hunger, rapid pulse, lowered blood pressure, diminution in erythrocytes and increase in the leucocytes; nausea or vomiting occur and abdominal pain, either localized or generalized, is complained of; the flanks are dull, but the shift in the line of dullness occurs in a manner which is unusually sluggish; rarely, a boggy, localized palpable mass is present within the abdomen.

Factors Favoring Bleeding

Hemoperitoneum results from direct penetrating abdominal wounds or the rupture of some intra-abdominal organ or vessel (ectopic gestation, ruptured lutein hematoma, perforation of bowel, aneurysm). Conditions in the abdomen favor a continuation of bleeding. The vessels (gastric, intestinal, mesenteric, omental, prevertebral trunks) lie in loose tissues; there is little resistance to the flow of blood into the cavity and fatal hemorrhage may arise from a surprisingly small point. Wounds or ruptures of liver and spleen bleed very rapidly, due to the vascularity and structure of these organs. More or less

* Previous installments of this book appeared as follows: January issue, p. 193; February issue, p. 459; March issue, p. 693; April issue, p. 912.

clearly defined masses, dull to percussion, sometimes form when the blood accumulates in limited regions (below the right lobe of the liver, about the spleen, in the lesser sac,

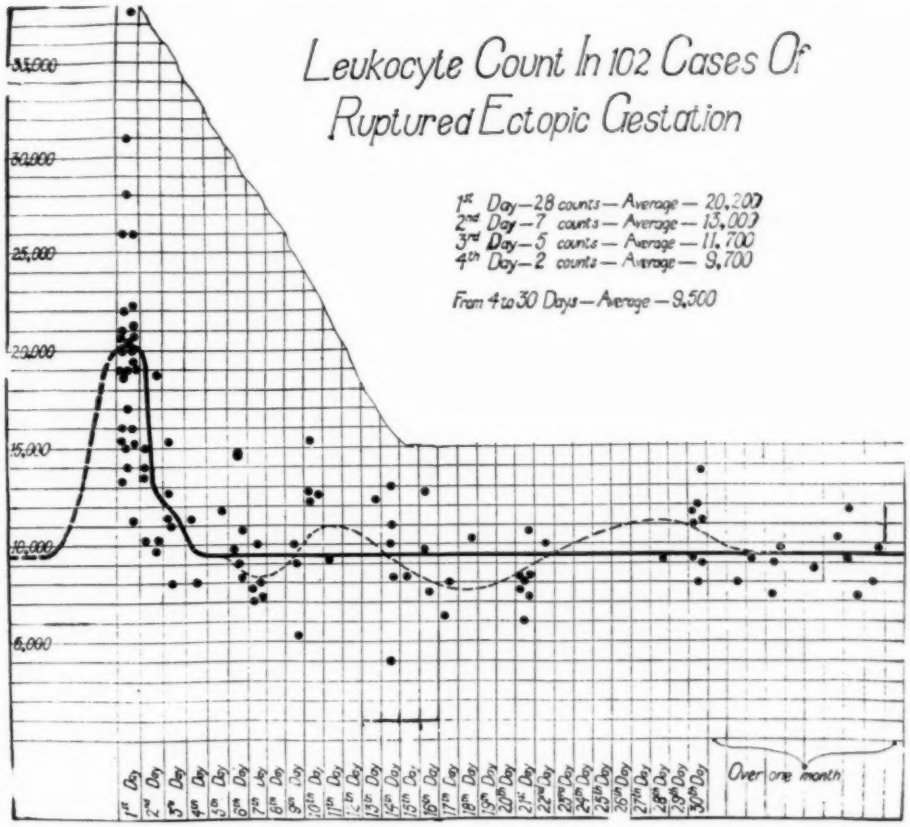


FIG. 68A.

The leucocytosis of subserous hemorrhage. (From Wright and Livingston.)

in the pelvis, within the retroperitoneal tissues). When the bleeding is of gastrointestinal origin hematemesis or melena may indicate the diagnosis.

Leucocytosis from Subserous Hemorrhage

The leucocytic curve after intraperitoneal, as after any subserous bleeding is typical.[82] This is a very important curve, for it occurs with conditions which may readily be mistaken for acute sepsis. The peak of the curve (200–300 per cent rise) is reached in eight hours (Fig. 68b). Hence consecutive counts within this early period show a rapidly rising leucocytosis

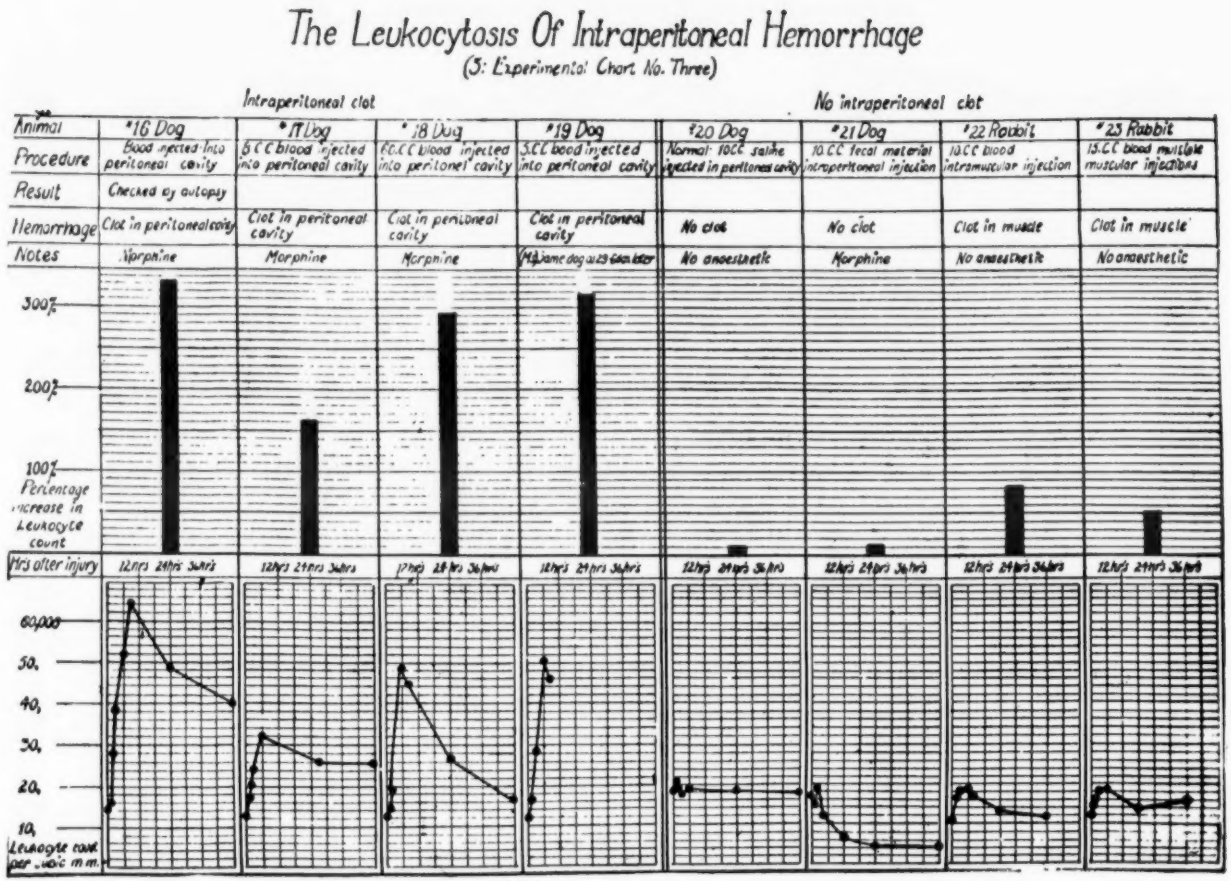


FIG. 68B.

The leucocytosis of subserous hemorrhage. (From Wright and Livingston.)

which may reach such figures as 30,000 or even 40,000 (Fig. 68a). From this early peak the count returns slowly to normal, which is reached by the fourth day unless new hemorrhages occur. The polymorphonuclear cells are both relatively and absolutely increased. This typical blood curve is unaffected by the quantity of intraperitoneal leakage or by the prompt removal of the clotted and fluid blood from the peritoneal cavity. Bleeding outside of serous cavities, regardless of the amount of blood extravasated, does not give rise to similarly marked leucocytic reactions; i.e., 2 c.c. of blood within the peritoneal cavity may produce a leucocyte rise of over 200 per cent while 200 c.c. of blood throughout the muscular and fascial planes will not double the normal count. This "leucocytosis with internal hemorrhage" is not to be confused with the so-called "leucocytosis following hemorrhage." The latter is the late, slight (20–50 per cent) leucocytic rise, which follows a severe loss of blood from the body. This compensatory leucocytosis does not reach its peak until the fourth day.

b. Bile Peritonitis (Choleperitoneum). The clinical picture with the intraperitoneal leakage of bile is that of a mild peritonitis: pain, nausea or vomiting, slight fever, distention. Rigidity is absent or slight after the initial invasion. Slight jaundice may be noted. The detection of bile in the urine or blood serum constitutes an even more delicate test than the observation of scleral discoloration. Free bile accumulates rapidly and all of the signs and symptoms mentioned in discussing the evidences of moderate amounts of free intraperitoneal fluids may be found upon examination. The bile soon becomes mixed with such serous or serofibrinous fluid as is thrown out by the peritoneum after any chemical or mechanical injury; unless infected, no pus will form. With infected bile the picture is changed to that of a severe pyogenic peritonitis.

Sterile Peritonitis

The bile may originate from the gall bladder, liver, biliary ducts, or even from the duodenum. Such leakage follows injuries (stab wounds), accidents (slipping of cystic duct

ligature after cholecystectomy) or occurs as a complication of biliary diseases (gangrene of gall bladder; erosion from stone). Although bile is very toxic and irritating when free within the peritoneal cavity, so far as the bile peritonitis alone is concerned the patient may be expected to recover if adequate surgical drainage is promptly established.

c. Chylous Ascites (Chylous peritonitis.) This is due to injury or blockage of the main abdominal lymphatics, particularly the receptaculum chyli and thoracic duct. The condition is characterized by (1) the very rapid accumulation of a large volume of milky or yellowish-white intraperitoneal fluid containing many fat globules but few cellular elements, and (2) the clinical picture of starvation and rapid emaciation. The fluid is identified as chyle only by microscopical and chemical examinations.

When there are symptoms of a disease in the neighborhood of the stomach, associated with extreme emaciation, free intraperitoneal liquid, and a tendency to copious, pale and fluid stools, a diagnosis of obliteration or rupture of the thoracic duct should be considered. Exact diagnosis depends upon study of the free fluid and the nature of the underlying lesion is usually conjectural until the time of operation or necropsy. The most common causes of chylous ascites are direct injury, filarial infection, or duct obstruction from malignant or other tumors (tuberculous glands). Fracture of the tenth thoracic vertebra has been responsible for the condition. It may also arise, the exact reason being uncertain, with the peritonitis sometimes associated with Bright's disease and leucemia. Although chylous ascites usually leads rapidly to death (70 per cent mortality), spontaneous absorption and cure have been known to occur.[83]

An accumulation of chyle within a hernial sac is termed a chylocele; chylous ascites has been discovered as a result of the laboratory examination of fluid aspirated from a chylocele.

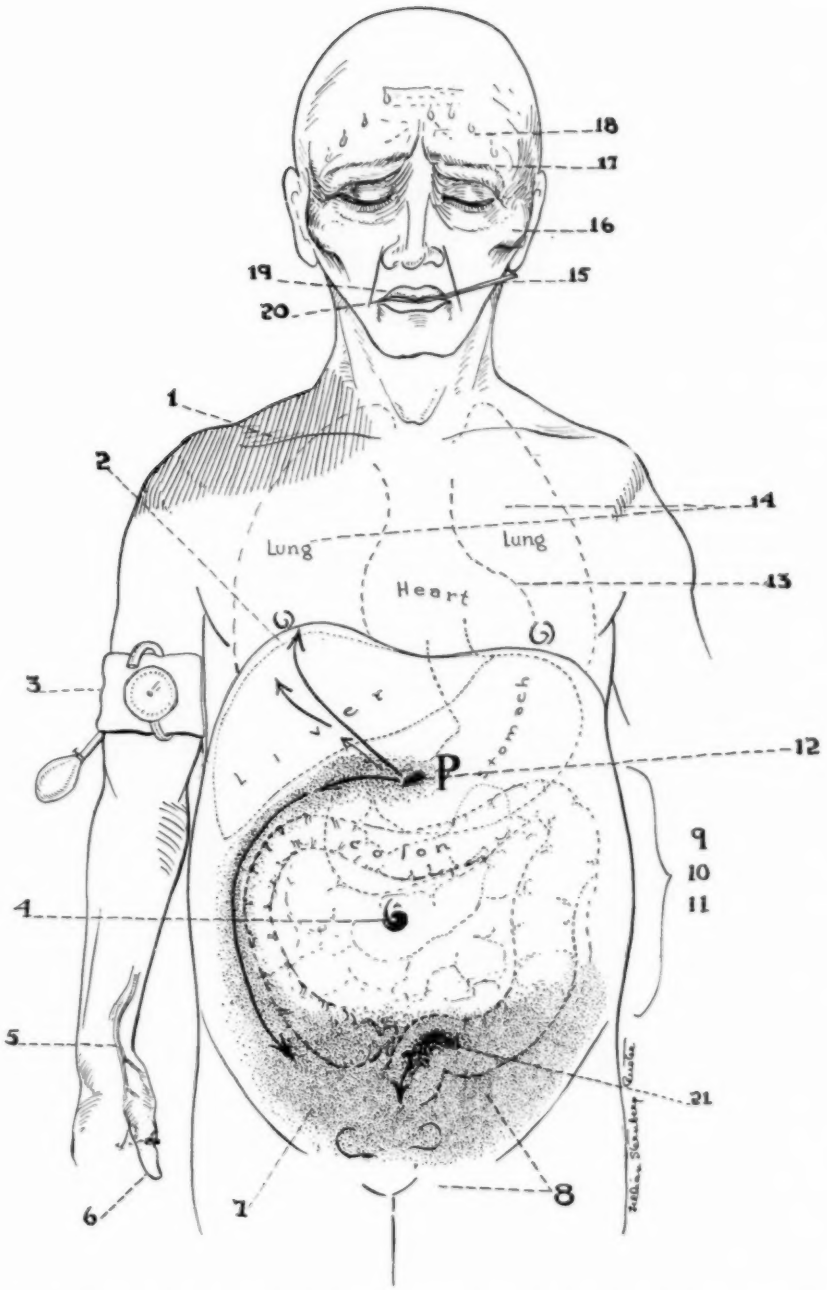


FIG. 69. Graphic study of some signs and symptoms caused by intestinal perforation.

1, Shoulder pain. 2, Free gas, obliterated liver dullness. 3, Altered blood pressure. 4, Umbilical pain. 5, Rapid pulse. 6, Blood count. 7, Free fluid. 8, Occult blood. 9, 10, 11, Tenderness, rigidity, dissolution of abdomen. 12, Epigastric pain. 13, Caped heart. 14, Dyspnea. 15, Subnormal temperature. 16, Pallor. 17, Pinched expression. 18, Perspiration. 19, Hiccough. 20, Vomiting. 21, Clotted blood in rectum.

Chylous vs. Chyliform Ascites

True chylous ascites is to be differentiated from pseudochylous or chyliform ascites in which a primarily ascitic fluid takes on a milky appearance from little understood chemical changes. Chyliform ascites is more common than true chylous ascites and the conditions must be distinguished by chemical and microscopic study of the fluid.

d. Free Enteral Contents. The clinical picture caused by intraperitoneal leakage of gastric and intestinal contents has already been discussed (see traumatic rupture of the small bowel). (See also Fig. 69.) Pneumoperitoneum and hemoperitoneum are often simultaneously present. The inability to demonstrate free fluid, however, is often a fallacious guide and should lead to no delay in operation when other evidence justifies the diagnosis of gastrointestinal perforation, since perforations are uniformly fatal unless treated by operation and each hour of delay adds to the risk. A particularly deceptive part of the clinical picture is the apparent well-being of the patient for a short period after the initial shock from the perforation has passed off.

e. Intraperitoneal Urinary Extravasation. This may result from injuries to the kidney, ureter or urinary bladder, the latter being the most common site. Bladder rupture is by no means frequent (encountered in 1 in 3000 general surgical cases) but the high mortality of this accident justifies its careful study (30 to 80 per cent mortality even under the most favorable conditions).[84]

The full bladder is an abdominal organ exposed to injuries (Fig. 70) while the empty bladder is a pelvic structure, protected and collapsed. Bladder rupture is always due to trauma, but the accident is favored by vesical distention, alcoholism and preexisting diseases of the vesical walls; it is often observed with fractures of the pelvis (25 per cent of patients with pelvic fractures suffer simultaneous bladddder injuries). Ninety per cent of cases of bladder rupture occur in males, due to the more violent nature of their activities, also to the greater depth of the female pelvis and the interposition of the uterus between

bladder and vertebral column. The true diagnosis is often ascertained only at operation since patients suffering from rupture of the bladder are frequently in shock when first

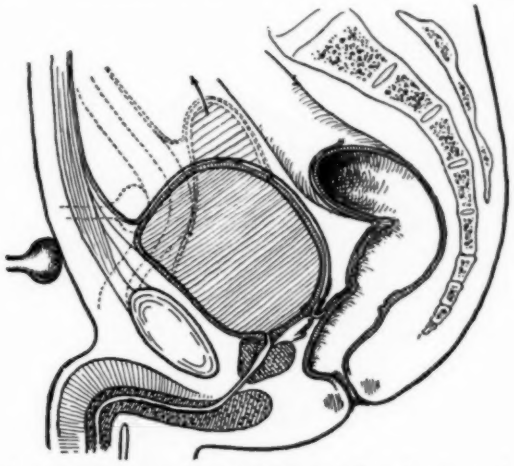


FIG. 70. Mechanism of rupture when bladder is full and trauma is in anteroposterior direction. Intraperitoneal rupture usually occurs. (After Rouvillois and Ferron, from Campbell in *Surg. Gynec. Obst.*)

seen and but a poor history is obtainable. The evidence is usually that of rupture of *some* viscus and the peritoneal cavity at operation is found filled with fluid having the typical appearance and odor of urine; the bladder rent is then discovered. Preoperative evidence of bladder injury, however, includes the following: inability to void, dysuria, hematuria, exquisite local bladder tenderness, a positive catheter test (more urine drained away then could have been held within the nondistended bladder, the fluid coming back through the bladder rent from the urine-filled peritoneal cavity; more sterile solution introduced through the catheter than could be held by the bladder alone. Further preoperative evidence is furnished by a positive vesical pneumoroentgenogram (150–100 c.c. of air are injected into the bladder and roentgenograms taken; if air has passed into the peritoneal cavity it reaches the subphrenic area and pneumoperitoneum is in evidence; if it reaches the retroperitoneal spaces air crepitus may be made out and the roentgenogram shows the distribution of the air; while if the

air remains within the intact bladder the film demonstrates this fact). Again the cystoscope may reveal the rent. If the extravasation is actually intraperitoneal the symptoms are those of an irritative peritonitis. As a rule the condition of the patient does not warrant prolonged study and the possibility of associated intra-abdominal injuries (ruptures of spleen, intestine, kidney) favors prompt exploration. To await the recovery from primary shock is generally viewed as unwise since the typical course without operative intervention is a progressive and rapid decline, with prompt death. Death is due to hemorrhage, shock, associated injuries, peritonitis.

f. Ascites. The fluid most frequently found free within the peritoneal cavity is that thin, serous, or watery substance which characterizes the condition known as true ascites, abdominal dropsy or hydroperitoneum. The causes of ascites have been classified by French as follows:[85]

(1) *Disease of the Peritoneum:*

Non-suppurative acute peritonitis
"Simple" chronic peritonitis
Tuberculous peritonitis
Malignant peritonitis, generally secondary to a primary growth elsewhere
Hydatid cysts in the peritoneal cavity.

(2) *Obstruction to the Main Portal Vein* by:

Non-suppurative thrombosis
Enlarged portal lymphatic glands:

Malignant	Tuberculous
Lymphadenomatous	Lymphatic leucemic

Tumors of adjacent organs, such as:

Liver	Duodenum
Pancreas	Colon
Kidney	Suprarenal capsule
Stomach	

Rarities such as aneurysm of the hepatic artery.

(3) *Diseases of the Liver:*

Cirrhosis

Perihepatitis, really part of chronic simple peritonitis

Carcinoma Sarcoma Syphilis Hydatid disease	Doubtful causes if the lesions are confined to the liver; i.e., if there is ascites, it is probably not due to the carcinoma, etc., in the liver, but to simultaneous affection either of the peritoneum or of the portal lymphatic glands.

(4) *Obstruction of the Inferior Vena Cava above the Hepatic Veins* by:

Thrombosis
Chronic mediastinitis
Mediastinal growth.

(5) *Chronic Failure of the Right Heart* ("*backward pressure*") the result of:

Valvular disease:
Mitral stenosis
Mitral regurgitation
Aortic stenosis or regurgitation with secondary mitral regurgitation:
Rheumatic or syphilitic
Congenital pulmonary stenosis (rarely)

Chronic myocardial affections:

Fatty degeneration	Fibroid heart
Fatty infiltration	Primary alcoholic heart
Fatty superposition	

Adherent pericardium
Chronic lung affections, especially:

Emphysema Recurrent bronchitis	Generally associated
Fibroid lung	

Chronic high blood pressure:

Red granular contracted kidneys
Pale granular contracted kidneys
Arteriosclerosis.

(6) *Bright's Disease.* In Bright's disease ascites may be caused in at least four different ways, namely, as the result of:

Part of a general dropsy
Acute peritonitis
Chronic peritonitis
Secondary to hypertrophy and dilatation of the heart, followed by failure of compensation.

(7) *Severe Anemias,* in which the ascites is usually the result of acute, subacute, or chronic intercurrent peritonitis, as in:

Splenomedullary leucemia	Splenic anemia
Lymphatic leucemia	Pernicious anemia
Hodgkin's disease	Aplastic anemia
Pseudo-leucemia infantum	Malaria.

6. A Clinical Consideration of Ascites. Ascites is always of serious import. This holds true whether the cause be medical or surgical, local or general. The condition implies either an extensive irritation of the peritoneal membrane itself or a severe interference with the circulatory system. The most common cause of ascites is heart disease; next in order come renal affections. The chief local or intra-abdominal causes are: (1) cirrhosis of the liver, (2) tuberculous peritonitis, (3) malignant peritonitis, and (4) other tumefactions which press upon the great vessels.

a. Ascites Due to Cardiac Disorders. Swelling and edema of the legs almost always precede the abdominal dropsy; the ascites is but part of a generalized edema which may include even the abdominal walls. The right heart is most often involved; the liberation of free fluid is due to a backpressure in the vessels (a transudate). A history of rheumatism is frequently obtained and the physical signs of mitral disease observed. The cardiac origin of the ascites is further indicated by irregular and rapid pulse, dyspnea or orthopnea, cardiac enlargement, precordial distress, enlarged and often pulsating liver. Forty per cent of cases showing a quart or more of ascitic fluid at autopsy have had heart disease as the cause of the ascitic accumulation.[86]

A. J. S., n. s. Vol. VIII, No. 5, p. 1120

b. Ascites Due to Renal Disorders. The usual condition present is chronic parenchymatous nephritis or Bright's disease. In this condition the ascitic fluid is but part of a general anasarca and it is proportionate to the accumulation of fluids throughout the subcutaneous tissues. The urinary findings include a scanty output, albumin and casts. Kidney function is found to be lowered and the blood urea high. Albuminuric retinitis may be present. Pouches are to be seen beneath the eyes; the patient may complain of headache, nausea or vomiting. The arterial tension is raised with accentuation of the aortic second sound. Cardiac and arterial disorders (myocarditis, arteriosclerosis) often coexist with the renal disorder.

c. Ascites Due to Severe Anemias. The hydroperitoneum occurs late in the course of the disease at a time when the diagnosis has as a rule already been established through the blood picture and associated evidence.

d. Ascites from Cirrhosis of the Liver. With cirrhosis ascites is a late manifestation. There is usually a history of alcoholism, hematemesis, melena, dyspepsia, jaundice. The spleen is frequently palpable. The patient has an hepatic facies. Dilated venules may be seen along the hepatic margins and over the abdominal wall.

e. Ascites with Tuberculosis of the Peritoneum. This may occur at any age; the greatest number of cases are found in the second and third decades of life. Tuberculosis is the most common cause of hydroperitoneum in children and in young women. Tuberculous peritonitis is usually secondary to tuberculous lesions elsewhere, notably in lymph glands, joints, bones or kidneys: the majority of cases are due to the bovine type of organism. A family history of tuberculosis is suggestive evidence and a personal history of a cervical adenopathy, pleurisy with effusion, chronic bone or joint disease or the discovery of a concomitant tuberculous lesion constitutes strong presumptive evidence that the ascites is excited by the tubercle bacillus. Aside from the involvement of the peritoneal

cavity as a part of a miliary tuberculosis, the following three varieties of tuberculous peritonitis are recognized: (1) the ascitic form, (2) the locular form, and (3) the fibroadhesive form. Of these the first variety is characterized by the presence of free fluid (68 per cent) and the second by encapsulated fluid (23 per cent). The condition may be symptom-free and be only accidentally discovered at operation or autopsy, but more commonly there are vague gastrointestinal complaints (anorexia, constipation alternating with diarrhea, nausea, irregular colics and pains throughout the abdomen), often associated with clinical evidences of infection by the tubercle bacillus (afternoon temperature, night sweats, general malaise). The physical signs are those of free or encapsulated intraperitoneal fluid with or without associated indefinite nodular or patchy masses throughout the belly. The abdomen may have a typically doughy feeling, that is, yield a sensation of boggy resistance. The infiltrated and chronically inflamed omentum and mesentery are shortened and retracted. The omentum itself tends to be pulled upward into a thickened roll lying transverse to the long axis of the cavity and somewhat to the left of the midline along its attachment to the transverse colon and greater gastric curvature; this often is plainly felt through the abdominal wall.

Ascites from Chronic Peritoneal Inflammations

Toma's sign, intended as a test in differentiating between inflammatory and non-inflammatory ascites, is based upon the shortening of the mesentery with chronic inflammations, drawing the intestinal loops to the right side of the abdominal cavity; as the patient lies upon his back there is tympany on the right (clumping of loops of small bowel) and dullness on the left (ascitic fluid) (Fig. 71). With non-inflammatory ascites, the intestines being unretracted, the distribution of the fluid is more uniform and the intestinal coils tend to float to a central location. The umbilicus, though normal in most instances, will bulge if the fluid becomes great in quantity, be thickened when multiple miliary or conglomerate tubercles exist at this point, be reddened or dusky with chronic conges-

tion due to rerouting of venous blood when there is a partial obstruction to the central vessels, or be the site of peritoneal or intestinal fistula formation from spontaneous rupture

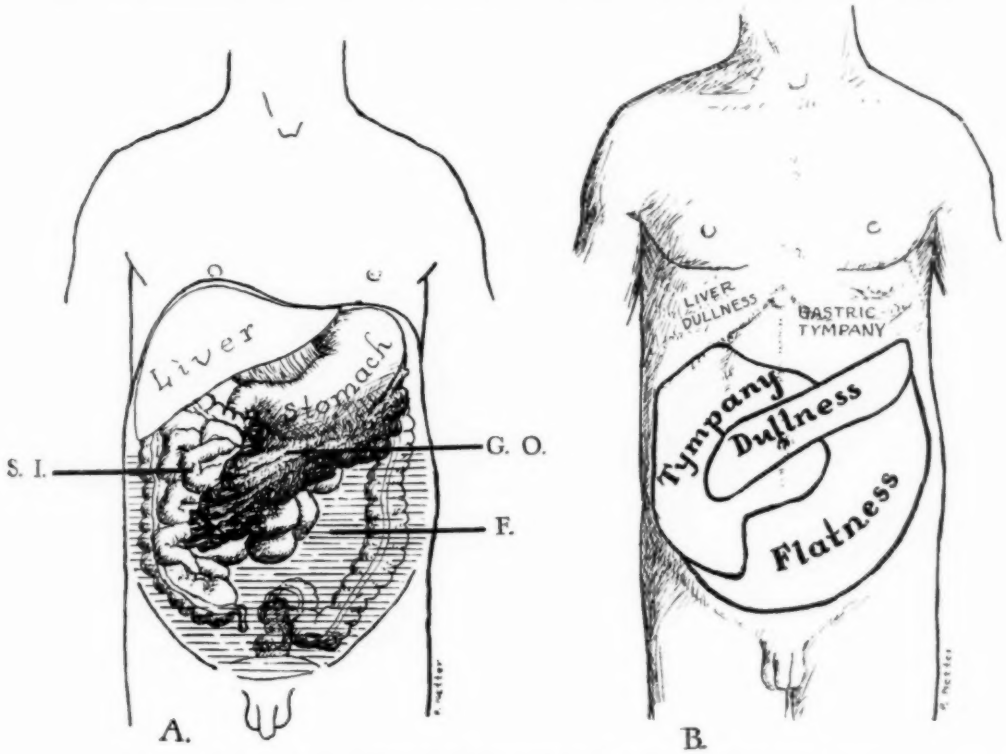


FIG. 71. Ascites due to chronic inflammation of the peritoneal membrane.

A. Showing retraction of mesentery pulling coils of small intestine upwards and to the right; retraction of great omentum forming a transverse roll or mass; free fluid fills the left lower quadrant and pelvis.

B. Showing signs obtained by percussion, tympany on the right and dullness or flatness on the left with the patient lying flat on the back. S. I. Small Intestine. G. O. Great omentum. F. Fluid.

occurring at this weakest and thinnest point in the abdominal walls.

The diagnosis of tuberculous peritonitis, made upon the presumptive evidence of the history and physical findings, may be established by the microscopical examination of excised pathological tissue, by seeing the typical miliary tubercles at operation or by guinea-pig inoculation of the intra-peritoneal fluid.

f. Ascites with Malignant Peritonitis. Cancerous disease of the peritoneum usually occurs in patients over forty; the quantity of fluid may be large and as a rule is blood stained;

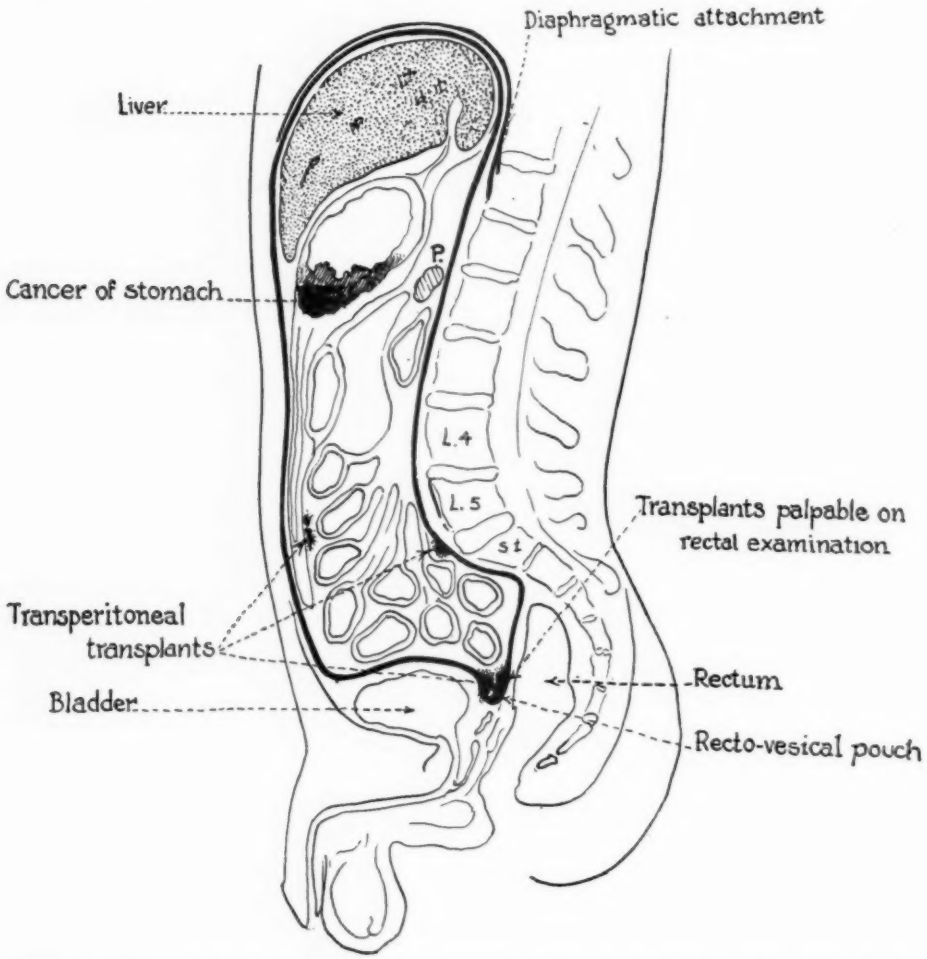


FIG. 72. Transcelomic malignant transplants, showing nodules of malignant tissue which have gravitated to the lowest portions of the peritoneal cavity and may be palpated through the rectal wall.

rapid emaciation and cachexia are the rule. Multiple nodules of characteristic consistency are frequently palpable; these may exist at any point but a favorite site is at the umbilicus where the disease has spread through extension along the falciform or round ligaments of the liver, the urachus or the obliterated

hypogastric arteries (lateral umbilical ligaments). Gravity plays a part in the transcelomic implantation of free cell clusters, thus frequent sites are the perirectal reflections of peritoneum, (causing firm nodules palpable through the rectal wall), the tunica vaginalis (giving rise to irreducible scrotal masses associated with a reducible or irreducible inguinal hernia); and the ovaries, which often lie upon the most dependent pouches of peritoneum. (See Fig. 72.) Primary cancer of the peritoneum is rare; the primary nodules which cause the secondary peritonitis should be sought, especially in the stomach, rectum, breast, uterus, ovaries, prostate and pancreas. Rectal digital and sigmoidoscopic examinations should routinely be made and the vaginal examination should not be omitted in the female. Enlarged lymph glands: pubic, inguinal superficial abdominal, supraclavicular (the so-called Virchow-Troisier gland on the left side) may be studied microscopically for the identification of the type of tissue of the primary growth. The worn, drawn, anxious facies, and the emaciation about the head, chest and upper extremities, associated in the middle-aged patient with a protuberant belly containing multiple hard nodules, present a quite typial clinical picture.

The Virchow-Troisier Glands

g. Ascites from Pressure upon Abdominal Vessels. In addition to the tumefactions of malignant and tuberculous peritonitis there are numerous other swellings and growths which produce back pressure in the great veins of the abdomen (the iliac and hepatic veins; the portal vein and its important radicals; the inferior vena cava). Among these are carcinomata of the liver, pancreas, and biliary adnexa; enlarged lymph glands, Hodgkin's disease, etc.; ecchynococcus cysts; retroperitoneal carcinomata or teratomata. These conditions are individually studied elsewhere. There is little that is characteristic about the ascites which they produce and the diagnosis usually is arrived at only by exclusion or is not made with precision until the time of operation or post-mortem examination.

General Clinical Rules. The following represent a few broad generalizations relative to ascites and the differentiation of its many causes.[87–90]

When edema and swelling of the legs precede the onset of ascites, heart failure is the most likely cause of the condition.

Ascites which is but part of a general anasarca with involvement not only of the abdomen and lower extremities, but also of the other body cavities, upper extremities, face, and even scalp, is generally due to renal disorders, notably acute Bright's disease. General edema associated with albuminuria points to renal disease as the cause of the ascites.

If jaundice is associated with ascites it points to some form of portal obstruction as the cause (most often to cirrhosis or malignancy of the liver).

If ascites is the only fluid accumulation present in the patient, if, although there is also swelling and edema of the legs, the ascites is known to have appeared first, or if the ascites is out of proportion to dropsy elsewhere, it is almost certainly due to some local or intra-abdominal cause, either some form of peritonitis, portal obstruction by a thrombus, pressure on the portal vein, or to cirrhosis of the liver.

If jaundice coexists, a slight degree suggests cirrhosis of the liver, an intense jaundice, malignancy.

A history or the manifestations of syphilis point to this form of liver affection; a history or evidences of alcoholism point to cirrhosis.

An ascites which has recurred after repeated tappings may be due to cirrhosis of the liver but is most often due to chronic hypertrophic peritonitis.

Ascites associated with multiple abdominal tumors suggests tuberculous or malignant peritonitis.

The evidence of a malignant growth elsewhere makes the diagnosis of malignant peritonitis almost certain.

Enlarged glands above the left clavicle point to malignant disease.

In children and young women tuberculous peritonitis is most common; in males over forty cirrhosis of the liver, chronic peritonitis, and cancer should first be thought of.

Persistent fever, the presence of old scars in the neck, or a concomitant pleurisy or known tuberculous lesion make tuberculous peritonitis the probable cause of the ascites.

F. PRESSURE VARIATIONS WITHIN THE ABDOMEN

Confusion concerning Pressures

The expression intra-abdominal pressure is frequently encountered in surgical literature. The term is routinely employed in discussions on peritonitis, ascites, penumoperitoneum, visceroptosis and intestinal obstruction. But no matter how casually intra-abdominal pressure is referred to, there always remains a certain vagueness as to the precise meaning of the term and specific figures as to the actual pressure or pressures present are difficult to find. The statement may be read that intra-abdominal pressure is always negative.[91] Similarly dogmatic assertions may be found that it is always positive.[92] At times it is recorded that a negative and a positive pressure simultaneously exist within the abdomen;[93] at others it is written that such coexisting differences in pressure within a single space are obviously impossible. In general, the impression seems widespread (because of a similarity of terms) that intra-abdominal pressure, in some indefinite way, is analagous in meaning to the well-understood term intrathoracic pressure.

The Variables

This ill-defined status of the subject may be explained by the fact that pressures within the abdomen depend upon many factors. Intra-abdominal pressure, as will later be made apparent, represents a complicated problem. The forces at work are numerous; and the combinations and interreactions of these forces are complex. Since the pressures themselves are variable it is not surprising that statements concerning them should also vary. Even the interpretation of manometer readings, because of the variables, proves a difficult matter. Authors in describing conditions which prevail within limited regions of the abdomen or which exist in prescribed circumstances have, at times, so extended their

statements and so generalized, that considerable confusing and conflicting data have accumulated. As is the case with any problem involving variables, accuracy is attained only as each variable factor is taken into consideration; generalizations prove misleading.

The Clinician's Interest in Pressures

The present aim in studying pressure conditions within the abdomen is to deal solely with clinical aspects of the subject. It seems essential that the clinician attempt some correlation of the conflicting statements of surgical literature. In order to recognize pathological increases or decreases in pressures and to search intelligently for their causes, a clear understanding is requisite of what constitutes the normal. Effective treatment as well as accurate diagnosis is dependent upon a thorough knowledge of the forces at work.

Methods for Study

In contrast to the frequency with which this term intra-abdominal pressure appears in surgical writings, little or no reference to the subject is found in textbooks on physiology. These source books on human function offer little aid. While they uniformly define and describe intrathoracic pressure, they give no similar definitions or discussions on intra-abdominal pressure. The subject must be studied, then, first, through a comparison of abdomen and thorax and, second, through an analysis of certain well-understood clinical observations.

Intrathoracic Pressure. Within the pleural cavities the pressure is subatmospheric. This relative negativity is said to be developmental in origin, arising from the more rapid growth of the chest wall than of the lung tissue and from the downgrowth during embryonic life of the diaphragm. This negative pressure is maintained by the rigid walls of the thorax which prevent the atmosphere from forcing the parietes inward to equalize pressures within and without.[94] If the ribs are removed or the chest opened, the negativity is diminished or equalized and the lungs collapse, due to their elasticity. During normal inspiration the thoracic cage is enlarged, increasing the relative negativity within the pleural cavity, and the outside pressure then forces air into the lungs until the limits of their distensibility are reached (Fig. 73). During the expiratory phase of the

respiratory cycle the weight of the chest (gravity) and the elasticity of the lungs (tension), combine to force the tidal air outward.

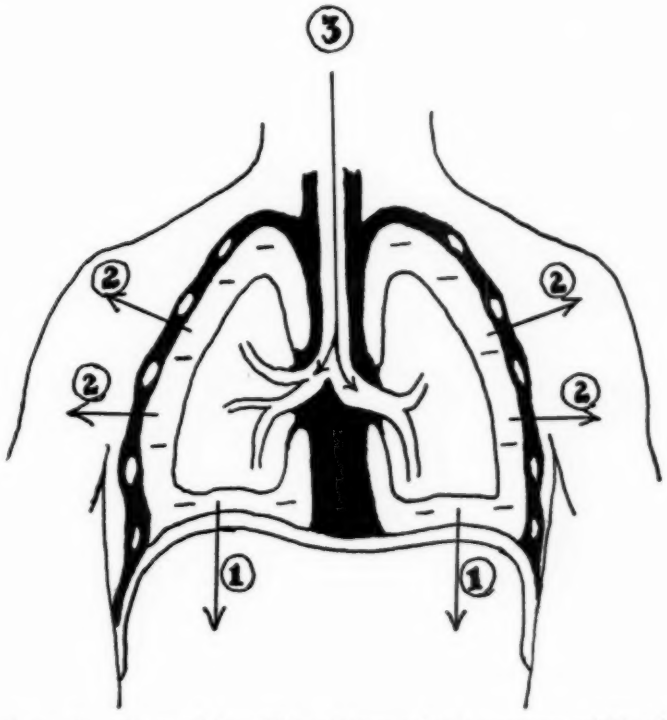


FIG. 73. Intrapleural negativity. The subatmospheric pressure within the potential pleural cavities is increased (greater negativity) as the diaphragm (1) moves downward and as the thoracic cage (2) is further enlarged by movements of the intercostal muscles and ribs; air is then forced into the lungs (3) by the pressure of the atmosphere.

The Non-rigid Walls of the Abdomen

It must be obvious that within the abdomen no similar marked and generalized negativity is possible, for the abdominal walls are muscular and contain no bony framework capable of resisting the force of the atmosphere. As pointed out, the definitions of the word chest (a box) and belly (a bag) imply fundamental differences in structure and behavior of the upper and the lower portions of the body wall. *Normally, then, the general pressure within the abdomen must tend to equal rather than to be above or below that of the atmosphere;* the muscular wall must tend to be driven passively inward when outside pressure is the greater (scaphoid abdomen) and

Muscular Tonicity

to be driven outward when inside pressure is greater (abdominal distention from fat, fluids, flatus, feces, fetuses: see preceding chapter). Yet the problem does not end here, for the muscular walls are not simply passive structures but possess tonicity; the walls are not only acted upon *by* pressures, but through alterations in their tonicity they may themselves play an important part in *producing* pressure-changes; the muscles are in reflex connection with many parts of the body and by reflex contractions, pressures are increased (cough) and by reflex relaxations, pressures may be relieved (see enteroabdominal reflex); the muscles of the abdomen (those of the roof, floor and walls) may act in unison, or separate muscle groups may act separately, some being opposed to others. Again, gravity plays an important role in determining local pressure conditions; the cavity is filled with organs having various and varying specific gravities, and these viscera press with varying degrees of force (static pressure) in various regions; body posture plays a part in determining where and how such static pressures will be exerted (a state of affairs which does not exist within the thorax). Still again, the hollow organs (bladder, stomach, intestines) possess intrinsic pressures of their own (intraluminary or intravisceral pressures); and any pressure change at one point in the abdomen must immediately be compensated for by resultant or secondary changes elsewhere (Fig. 74). It is apparent, then, that the problem of intra-abdominal pressure is by no means simple. The term may mean much or little and be used accurately or erroneously, according to the care with which the constantly changing intra-abdominal conditions are interpreted.

Static Pressures (Gravity)

Intraluminary Pressures

Adhering to the practical purpose of discussing only clinical aspects of the subject, attention will be directed to some of the individual forces at work.

1. Effects of the Muscular Walls. The distensibility of the abdominal walls proves to be a compensatory mechanism of great value. Since the cavity can enlarge, any actual pressure-

increase within may be delayed, diminished or prevented. When a plaster-of-Paris jacket has been applied around the abdomen, doing away with distensibility, any marked increase

The Plaster Jacket and the "Dinner-Pad"

FIG. 74. Showing abdomen completely filled with viscera. Any pressure change at one point must be compensated for by an immediate resultant or secondary change elsewhere within the cavity. (From Edinburgh Stereoscopic Anatomy).

in intra-abdominal pressure is quickly followed by severe and alarming symptoms.[95] These are chiefly due to an interference with respirations through upward displacement of the diaphragm and to circulatory embarrassment through displacement of the heart or interference with the supply of venous blood returning through the inferior vena cava. It is well-known, clinically, that in applying a plaster jacket ample space must be left over the anterior abdominal wall, if these unpleasant and dangerous sequelae are to be avoided (Fig. 75). Such a space is created by placing a so-called "dinner-pad" of folded towels over the anterior abdominal wall as the plaster is applied and subsequently removing the towels from the lower margin of the cast, thus leaving a space between jacket and

skin. This pad may be omitted if the patient has partaken of a hearty meal just before the coat is applied.

Not only are alarming symptoms sometimes caused by

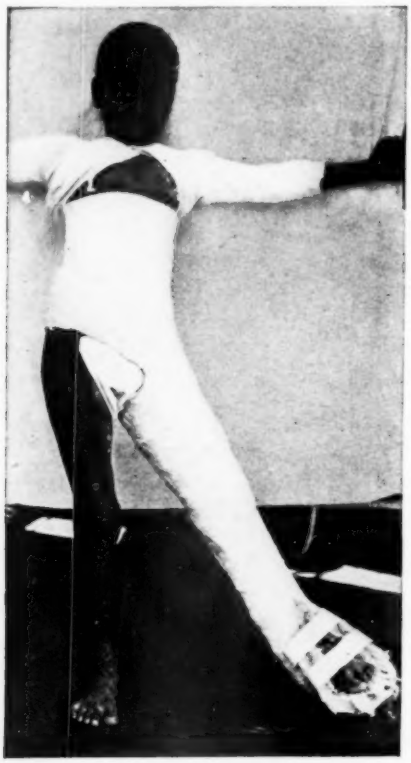
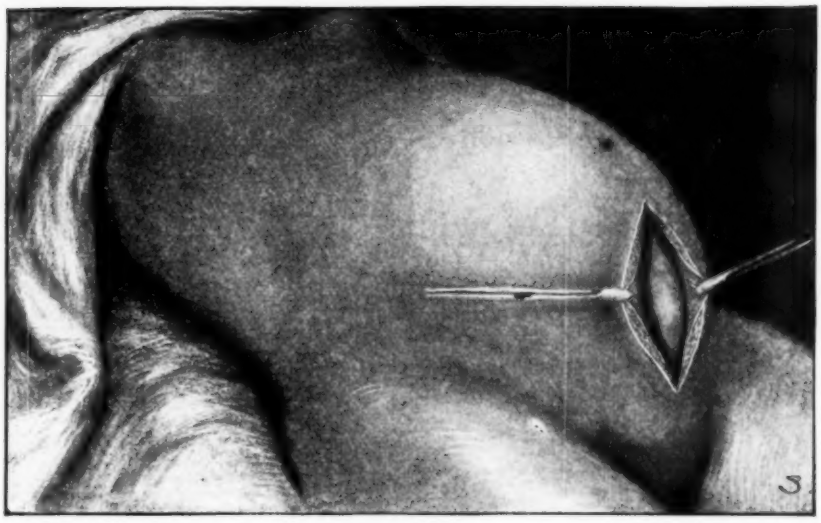


FIG. 75. Abduction plaster-of-Paris splint. Note the soft pad situated beneath the plaster over the anterior abdominal wall. (From Moorhead's Traumatic Surgery, Saunders.)

The Sudden Release of Intra-abdominal Pressure

marked increases in the general intra-abdominal pressure but dangerous results may also attend the too sudden release of such an increased pressure, particularly where this has been of long duration. Thus the drainage or removal of a large ovarian cyst may suddenly be followed by an overfilling of the relaxed abdominal veins with consequent partial emptying of the heart, followed by cardiac failure. To avoid this accident, an assistant should be assigned during the operation, to the task of maintaining direct pressure upon the abdominal walls.[96] To this end the assistant, with his hands spread out, should firmly

A. J. S., n. s. Vol. VIII, No. 5, p. 1132



A

B

FIG. 76.

A. Location and length of the incision for tapping the cyst immediately before removal. Such tapping is occasionally advisable, in cases where the tumor is large and interferes with respiration so much as to necessitate beginning the operation under local anesthesia.

B. Tapping the cyst: Note how assistant maintains a continuous pressure on the abdominal walls as the fluid is being withdrawn. (From Crossen's Operative Gynecology, Mosby).

press upon the external abdominal walls from the instant the tumor is delivered (Fig. 76). This positive external pressure should be continued until a firm binder can be applied over a large pad of cotton, and thus from the completion of the operation the abdomen may be supported until the vascular system has become stabilized. Similarly, care must be exercised in performing an abdominal paracentesis that pressure-relief is not too sudden.[97]

The Scaphoid Abdomen

The scaphoid or navicular abdomen illustrates a passive collapse of the abdominal wall from inadequate opposition to the constant inward pressure of the atmosphere (approximately 15 lbs. to the square inch). Such abdominal retraction follows a severe reduction of the general intra-abdominal pressure, for example that following starvation, with the marked loss of weight in advanced carcinoma. The abdominal walls appear as though pushed inward by a huge fist. Muscular action could not explain this retraction for the scaphoid abdomen is usually found upon palpation to be soft, and were this shape simply due to a passive in-falling of the walls from the action of gravity as the patient assumes the dorsal decubitus, they would tend in a similar manner to fall flaccidly and passively outward when the erect posture was assumed. This, however, does not occur and the boat or bow-shape is maintained, in all positions, by the inward force of the atmosphere.

Contraction of the Walls

A simultaneous contraction of all of the muscles of the abdominal walls must cause a temporary increase in the general intra-abdominal pressure, quite regardless of what that pressure might have been before such contractions took place. As the pelvic floor is drawn upward, the anterior wall inward, and the diaphragm downward, aid is given to such acts as those of parturition and defecation. This action is enhanced by closure of the glottis. During the second stage of labor the abdominal pressure is a powerful auxiliary. "During an expulsion pain the woman closes the glottis and makes a powerful bearing down effort. She forces down the diaphragm and

Parturition

A. J. S., n. s. Vol. VIII, No. 5, p. 1134

contracts the recti, the obliqui, and the muscles of the flanks. There is now a great increase of the intra-abdominal pressure which, obeying the law, is transmitted equally in all directions,

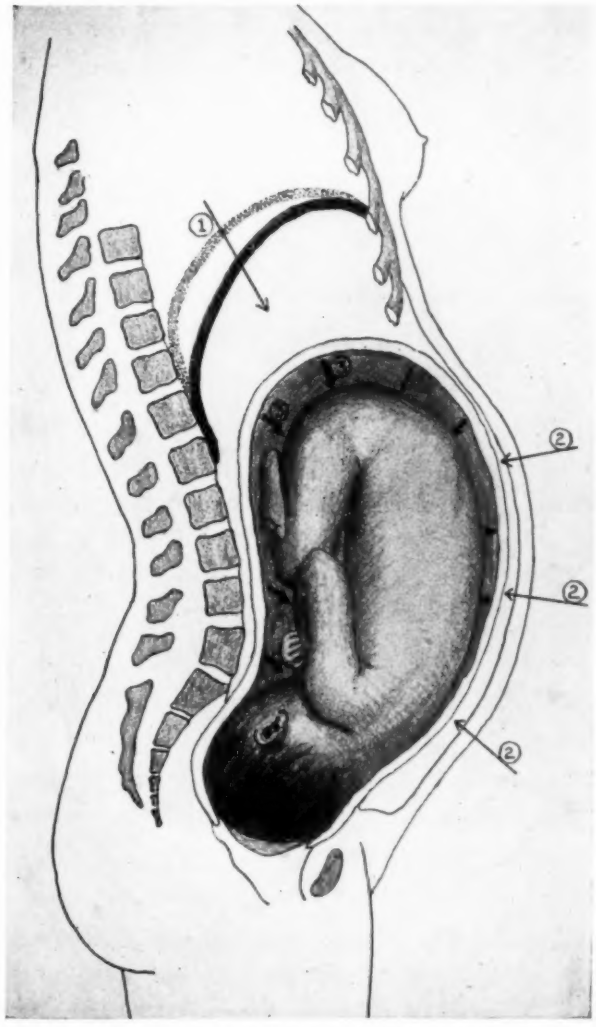


FIG. 77. The muscles of the abdominal walls acting as "auxiliaries" during the second stage of labor. "Intra-abdominal" pressure is added to the intrauterine pressure, aiding in the act of expelling the uterine contents. (Modified after DeLee.)

1. The downward movement of the diaphragm.
2. The inward movement of the abdominal walls.
3. Contraction of the uterine walls.

the uterus receiving its share (Fig. 77). It is easy to see how the abdominal pressure is simply added to the intrauterine

pressure, resulting in increased general intrauterine pressure."[98]

McBurney and the Cough Impulse

Sudden voluntary increases in intra-abdominal pressure often prove of aid in diagnosis. The value of the cough impulse in the examination for inguinal hernia is well known. McBurney also made use of such a pressure increase in his test for acute appendicitis. In an original article, describing his point of maximal tenderness he wrote:[99] "I do not mean a tenderness elicited by pressing the entire hand into the right lower quadrant, but one which is definitely greatest at the point described, perhaps no greater an area than the tip of the index finger, where pain on pressure is most marked, particularly as the patient coughs." This voluntary increase in pressure was also used by Murphy in his method of examination for acute diseases of the gall bladder. The so-called "deep grip palpation test" which elicits the objective sign known as "Murphy's expiratory grunt" makes use of a steady pressure against the gall bladder, but relies upon the diaphragm to tell the story. The test is made as follows:[100] "standing directly behind the patient, providing the patient is well enough to assume the upright position, (while if not the examiner reaches over the recumbent patient from the head) the right hand of the examiner curls up under the right costal arch at the tip of the ninth cartilage; the patient is requested to take a deep breath and at the end of the expiration the examining finger seeks the gall bladder area and fixes it from beneath; the diaphragm, descending from above with the beginning inspiration, brings down the liver and gall bladder, and if the cholecystitis of cholelithic obstruction is present, the descent is checked suddenly with an accompanying groan from the patient. For the diaphragm, acting as a great piston of respiraton, forces the distended, inflamed or congested gall bladder downward upon the firmly fixed hand, and the result is an abrupt cessation of the inspiratory act" (Fig. 78).

Murphy's Expiratory Grunt

Aids to Palpation

Voluntary contraction of the diaphragm with deep inspiration or coughing, may also be used in detecting indefinite tumor

A. J. S., n. s. Vol. VIII, No. 5, p. 1136

masses which tend to slip away from the examining fingers into the depths of the upper abdomen. Here, the palpating hands upon the anterior abdominal wall are held motionless while the

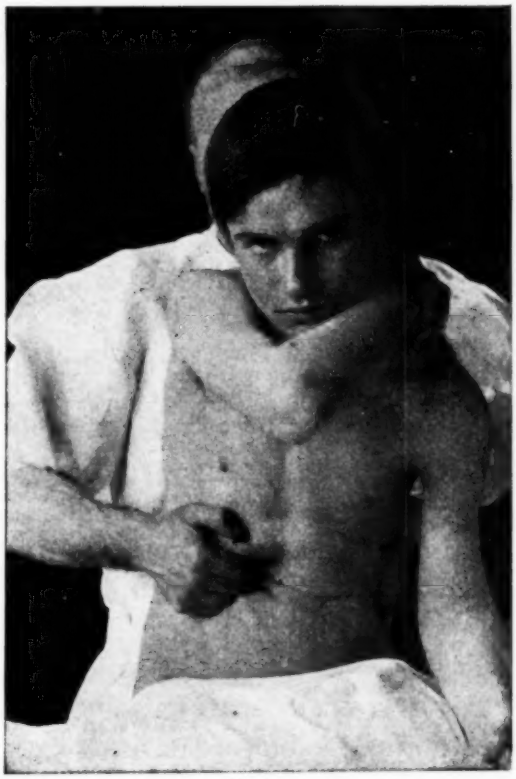


FIG. 78. "Deep-grip palpation." (From Keen's Surgery, Saunders.)

patient is asked to take a deep inspiration; thereupon the diaphragm, acting as though it were a huge internal hand, forces the mass downward against the examining fingers. This method of utilizing the diaphragmatic contraction may be combined with a use of gravity, carrying out the maneuver with the patient in the knee- elbow position.[101] Thus, as gravity carries the mass forward and the diaphragm forces it downward the examiner may often feel and definitely delimit a tumor, where before he had only a vague impression as to its existence. Still another use of voluntary muscular contraction for diagnosis may be demonstrated by the ease with which

weaknesses of the anterior abdominal wall may be seen and felt as the patient contracts the diaphragm, recti, and associated muscles in attempting to change from the supine to the sitting posture without the aid of his hands. The patient, it will be noted, closes the glottis and contracts the diaphragm during the effort to arise.

Dyspnea from Abdominal Disorders

When a pathological increase in the intra-abdominal pressure is associated with rigidity of the abdominal walls, any increase in abdominal capacity must be made at the expense of thoracic capacity, through an elevation of the diaphragm. Such a diaphragmatic elevation promptly gives rise to dyspnea or circulatory embarrassment. Because of the muscular rigidity present, inflammatory distentions give rise to pressure symptoms earlier than do those of purely toxic origin (where the walls may remain relaxed).

Certain mental defectives and neurotics may display in an interesting fashion the reciprocal relationship which exists between the diaphragm and the muscles of the anterior abdominal wall: By maintaining the diaphragm in a condition of spastic fixation, then simultaneously relaxing the anterior abdominal muslces, these patients are able to create the appearance of being tremendously distended (an hysterical tumor).[102] The administration of an anesthetic causes this "mass" to disappear immediately (phantom tumor). The swallowing of quantities of air (aerophagia) serves to enhance the tumefaction of the abdomen.

A Phantom Tumor

Still another example of an alteration in pressure due to changes in muscle tonicity is the effect upon the abdominal circumference of the ingestion of food. When food enters the enteric canal the intra-abdominal content is necessarily increased. To prevent this from causing an undue change in the actual intra-abdominal pressure, the abdominal walls become relaxed, through their reflex connections with the intestinal mucosa.[103] Such a reflex relaxation of the muscles may be experimentally demonstrated through the distention of balloons which have been placed within the enteric canal.

The Entero-Abdominal Reflex

It is this reflex (entero-abdominal or alimentary reflex) at least in part, which causes the loosening of belts after meals. The change in the abdominal circumference is often out of all proportion to the amount of food ingested. An abnormally active reflex may give rise to "bloating" immediately after the taking of even a glass of water, a cracker or other substance of small bulk.

Rise in Blood Pressure from Increased Intra-abdominal Pressure

It has been shown that the injection of a definite amount of air or fluid into the peritoneal cavity causes a rise in the sytolic blood pressure, while the injection of a similar amount of the same substance into the enteric tract is not followed by a similar rise in pressure. An explanation of this observation, which would seem most puzzling since the same amount of the same substance placed within the same space (abdomen) acts so differently according to the site of the injection, is offered by this enteroabdominal reflex which accounts for the relaxation of the abdominal wall, thus preventing any marked increase in the intra-abdominal pressure, when the increased bulk occurs in the intestinal lumen (simulating normal eating).[104]

2. Abdominal Effects of the Intrapleural Negativity.[1] It has thus far been pointed out that the abdomen, a muscular sac exposed constantly to the action of the atmosphere, must tend to have a pressure which is approximately equal to that of the atmosphere itself; that when conditions arise which would otherwise increase the intra-abdominal pressure (paralytic ileus; excessive fat; ascites; tuberculous peritonitis) the muscle walls passively belly outward in such a fashion as to reduce the actual pressure within, and that when conditions arise which might otherwise cause a decrease in intra-abdominal pressure (diarrhea; dehydration; starvation; excessive loss of fat) the muscular walls are pushed inward (scaphoid abdomen) in such a fashion as again to diminish the actual change of pressure within the abdomen; that, however, by an active and simultaneous contraction of all the muscular walls the general intra-abdominal pressure may

suddenly be made to increase; but, upon the other hand, that there is no mechanism by which these muscular walls are capable of creating a generalized and sustained pressure which

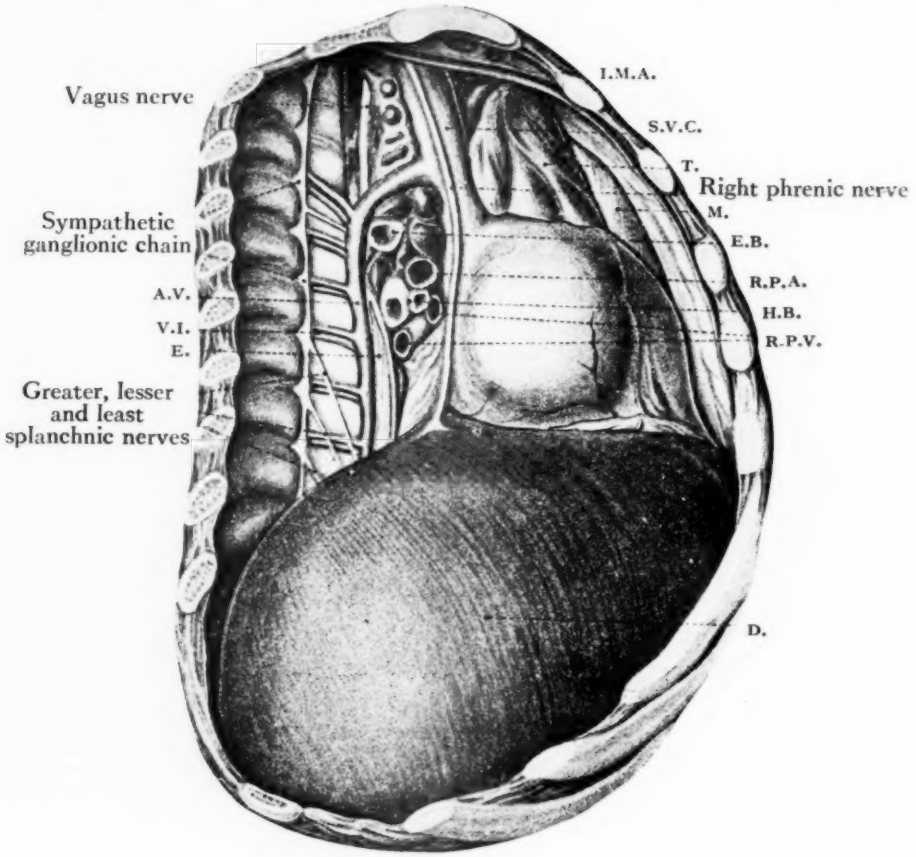


FIG. 79. Note the dome-shape of the diaphragm.

is below that of the atmosphere (a subatmospheric pressure). Notwithstanding these facts, there is one region within the abdomen in which a subatmospheric pressure is known to be normally present, i.e., the region immediately below the diaphragm. This negative pressure within the upper peritoneal cavity may be explained by the proximity of abdomen and thorax; it is a borrowed or reflected negativity; one which depends upon conditions present within the thorax, not upon the abdomen itself.

A Reflected Negativity

A. J. S., n. s. Vol. VIII, No. 5, p. 1140

The Dome Shape of the Diaphragm

The abdomen is separated from the thorax only by a non-rigid partition. The dome shape of the diaphragm demonstrates the upward pull created by the subatmospheric pressure within the pleural cavities. The diaphragm does not gain its upward curvature through being suspended from above by thoracic structures. This must be apparent, since nothing pierces or is attached to the diaphragm at the points of greatest elevation (domes.) (Fig. 79.) Again, if the diaphragm were suspended from above, its normal excursions could not be made. It must be equally obvious that the diaphragm is not pushed upward from below, for when all abdominal organs have been removed (autopsy), the upward curvature remains. That the diaphragm is sucked upward by the subatmospheric pressure within the pleural sacs is demonstrated by the even higher levels to which the midriff ascends after a phrenic nerve has been paralyzed (eventration). The thoracic lifting effect may be still better shown as follows: suspend a cadaver in an upright position; observe the levels of the diaphragmatic domes and of the abdominal viscera; then open one of the pleural sacs, allowing an equalization of pressures; observe that the domes of the diaphragm, and also the abdominal organs, descend as air is admitted to the thorax.[105]

The Upward Pull of the Thorax

The same force which draws the diaphragm, upward, also exerts an upward pull upon the movable viscera of the abdomen. Thus, when a weakness occurs in the midriff, some movable organs of the upper abdomen actually enter the thorax. Thoracic suction is demonstrated by the fact, already referred to, that when the reduction of these herniated organs proves difficult or impossible from the abdominal side, the mere opening of the pleural cavity will often result in an easy or even spontaneous replacement of the viscera (the suction action overcome).

An important result of the negative pressure within the upper peritoneal cavity is that after perforation has occurred in some air-containing viscus, the free air which accumulates in the peritoneal cavity travels upward to the subdiaphrag-

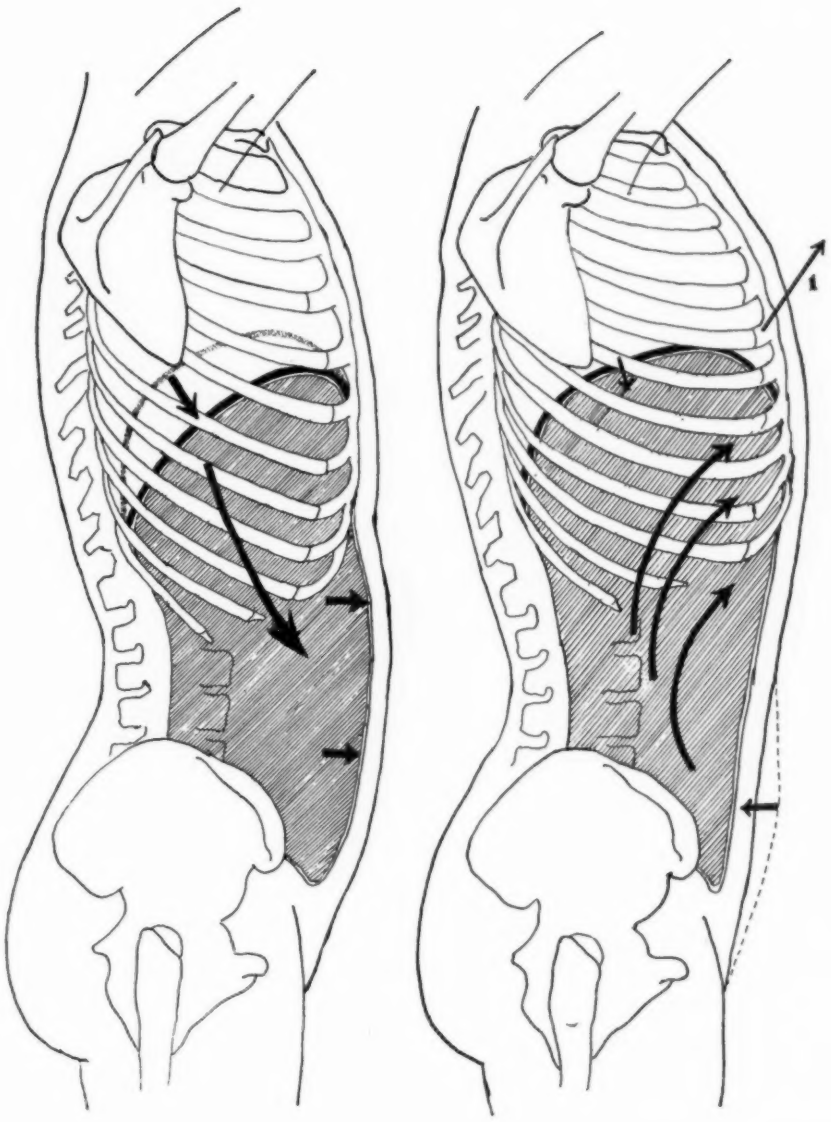
matic region. Even small amounts of gas tend to cause an early diminution or loss of liver dullness. The promptness and frequency with which shoulder pain is observed in the presence of free fluid or gas within the abdomen, demonstrates a subdiaphragmatic negativity. This early irritation of the central portion of the under surface of the diaphragm (with its attendent shoulder pain) often occurs even when the free substances originate at pelvic levels. Obliterated liver dullness from enteric perforations (Clark's sign) is best observed in the midaxilla.[106]*

Obliterated Liver Dullness

3. Effects of Thoracic Movements. Contrary to what might be expected, the negativity within the upper peritoneal cavity is greater during inspiration than during expiration.[108] It might seem reasonable, upon superficial consideration, to assume that as the diaphragm moves downward (inspiration) the pressure within the abdomen must, of necessity, be increased. Yet manometer readings show that normally the negative pressure below the diaphragm is greatest during the inspiratory phase of the respiratory cycle, and that the greater the depth of thoracic breathing the greater the upper abdominal negativity during inspiration. This is true because the descent of the diaphragm is not the only, nor at times the most important, accompaniment of inspiration. It may be observed that in addition the diameter of the lower thorax (upper abdomen) undergoes an increase during the inspiratory act (Fig. 80). The fact that the abdomen extends upward so far within the thoracic cage (see midriff; roof of abdominal cavity) and that the upper abdomen is covered by ribs and thoracic walls, makes it inevitable that pressures within the upper abdomen should be markedly effected by movements of the thoracic cage. This increased abdominal circumference may more than equal the effect on pressure of the descent of the diaphragm. As might be expected, this effect of thoracic movements varies

Respiratory Increases in the Abdominal Circumference

* Although this sign is present in but a minority of cases its value, when present is great. It has been said (Cope): "If in any acute abdominal case distinct resonance be obtained over the liver in the midaxillary line, about two or more inches above the costal border, one is certainly dealing with a perforation of a gastric or duodenal ulcer."[107]



A B

FIG. 80. Abdominal and thoracic types of breathing.

A. Abdominal inspiration: As the diaphragm descends there is a downward force which tends to cause bulging of the lower abdominal walls (general increase in intra-abdominal pressure).

B. Thoracic inspiration: As the anteroposterior and transverse diameters of the thorax are enlarged there is enlargement also of the upper abdomen resulting in an upward pull or "lifting" force within the abdominal cavity and the lower abdominal walls tend to move inward (general decrease in intra-abdominal pressure). Note: The slight movement of the diaphragm has not been shown.

Pressure Variations with Various Types of Breathing

somewhat with the patient's type of breathing. With distinctly thoracic breathing (the costal muscles predominating) the general intra-abdominal pressure tends to fall during inspiration; with quiet normal breathing (combined abdominal and thoracic type) a fall in pressure within the upper abdomen synchronous with inspiration, is still observed; and it is only with the breathing of the abdominal type (thoracic cage remaining relatively quiescent) that the general intra-abdominal pressure shows any tendency to rise (increase) during the inspiratory act. The accuracy of these statements may roughly be tested by placing one hand over the lower portion of the abdominal wall and the other upon the upper portion while experiments are conducted with the various types of breathing, noting how the hands rise, sink or remain stationary during the inspiratory phase of the respiratory cycle.

Opening the Peritoneal Cavity

The presence of an upper abdominal negativity and one which tends to increase during inspiration, explains why there is a minimum of danger of injury to abdominal structures when the peritoneal cavity is opened at its upper levels, particularly when this is done during the act of inspiration. The daring surgeon will, at times, cut through the abdominal wall without taking the precaution of picking up the peritoneal membrane before incising it. He knows from experience that with the first knick of the peritoneum, air usually rushes into the peritoneal cavity and "the organs fall away from the abdominal wall as the potential cavity becomes real." This is not, as is so often stated, an index that the peritoneal cavity possesses at all times and in all situations a generalized subatmospheric pressure, but is due to the fact that during inspiration (particularly with the forceful type observed under general narcosis) the thoracic cage is enlarged and with it the circumference of the upper portion of the abdomen, i. e., the abdominal walls are moving *away from* the intra-abdominal viscera (Fig. 81). This maneuver of incising the peritoneal cavity without picking up the peritoneal membrane has been repeatedly executed with impunity, but the wisdom of the procedure

is open to question, since upper abdominal adhesions or intravisceral distentions may have altered the pressure conditions which normally made the procedure possible. In opening the

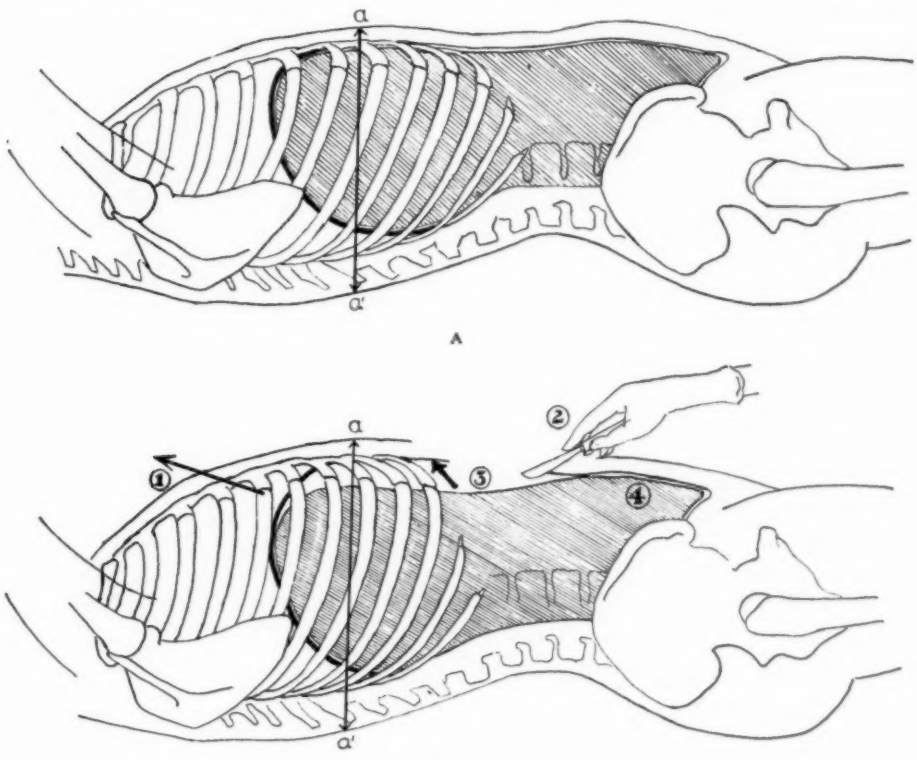


FIG. 81.

A. Abdomen at respiratory rest. Shaded area represents abdominal viscera.

B. Opening the upper abdomen during inspiratory phase of respiratory cycle. Note increase in the anteroposterior diameter (a — a′) as the upper wall is pulled away from the abdominal viscera during forceful thoracic breathing. (1) Upward pull of thoracic cage. (2) Knife making incision. (3) Space between viscera and upper abdominal wall. (4) Little or no space between lower abdominal viscera and wall.

abdomen at lower levels, where the effects of the thoracic respiratory expansions are less noticeable and there is no respiratory increase in the abdominal circumference, one should always pick up the peritoneum and lift it away from the organs below before it is incised.[109]

4. THE EFFECT OF INTRALUMINARY PRESSURES. Each of the hollow viscera (stomach, intestine, gall bladder, urinary

bladder) has an intraluminary pressure of its own. These internal pressures are continually changing and they all have an influence upon the general intra-abdominal pressure. Any pressure change, whether an increase or decrease, within one organ must be compensated for by changes in other structures or by a change in the size of the cavity as a whole. The detailed study of these individual intrinsic pressures will be found elsewhere (see movements of the intestinal tract, basis of abdominal symptoms); but a few clinical points will be presented to illustrate the relationship existing between intravisceral, intraperitoneal and general intra-abdominal pressures.

Normal Disposal of Intestinal Gases

The most common cause of a general increase in intra-abdominal pressure from visceral distention is that which occurs with accumulations of gas or fluid within the gastro-intestinal tract (tympanities; tumid abdomen; paralytic ileus). It is obvious that with a complete mechanical obstruction of the bowel there must result an increasing accumulation of contents (food, water, products of glandular secretion) cephalad to the point of obstruction. It is, however, not quite so obvious how an even more rapid collection of gas or fluid may occur within a loop of bowel which is isolated, i.e., one which has been cut off from the remainder of the enteric tract and is receiving no increase in substance from above, (example, strangulation ileus). This phenomenon, and others which must be dealt with in the diagnosis and treatment of the many varieties of intestinal obstruction, are due to the fact that the integrity of the circulation has more bearing upon the rate and severity of distention of bowel than has the integrity of the intestinal lumen.[109] Only a small proportion of intestinal gases are eliminated through the anus while the great bulk is absorbed into the circulation, there to be altered chemically or eliminated through other channels. The elimination of intestinal gases through the lungs alone is estimated to exceed that occurring by way of the anus by a proportion of ten to one. This explains the fulminating character of the

distention observed with mesenteric thrombosis. Indeed it is a general rule that the more sudden the occurrence of meteorisms the more likely is the cause to be an interference with blood supply rather than one of mechanical interference with the enteral lumen alone.[110] The disappointing results which often follow the relief of a mechanical obstruction are probably due, in many cases, to vascular alterations which have concomitantly occurred. Thus it is usually necessary to empty the bowel at the time of operation for intestinal obstruction as well as to resect gangrenous gut or to remove the actual obstruction at the lumen. The statement has been made that no operation for intestinal obstruction may be considered complete if the abdomen remains distended at the time of abdominal closure.

Mesenteric Thrombosis vs. Mechanical Ileus

Much harm may result from suddenly decompressing an abdomen distended by paralized bowel, *in the presence of an acute peritonitis.* This is particularly true when the patient has reached a critical or moribund condition. To perform an ileostomy and allow the trapped gas and fluids to gush forth, as is sometimes done, until the ultimately desirable relaxation of the walls has occurred, must exert a great strain upon the circulation and have an effect upon protective adhesions somewhat similar to that of running the hands through the abdomen, pulling one loop of bowel from another until all pockets of pus have been turned into a single pool. Patients so handled not infrequently die a few hours after operation with evidences of circulatory failure and with a steadily rising temperature. After the ileostomy has been performed, the catheter or tube leading from the bowel may, to advantage, be intermittently clamped and opened, and the pressure thus more carefully and gradually reduced.

Ileostomy with Peritonitis

It has been suggested that splanchnic nerve block or spinal anesthesia be utilized in selected cases as a therapeutic measure for securing relief from intestinal stasis.[111] The process is described as an activation of the vagus, or motor mechanism of the bowel, secured through an induced paralysis

Splanchnic Nerve Block for Paralytic Ileus

of the splanchnic nerves, which have been exerting an undue inhibitory influence upon enteral motility. (Fig. 82.) Care must be used in applying this suggestion since the method

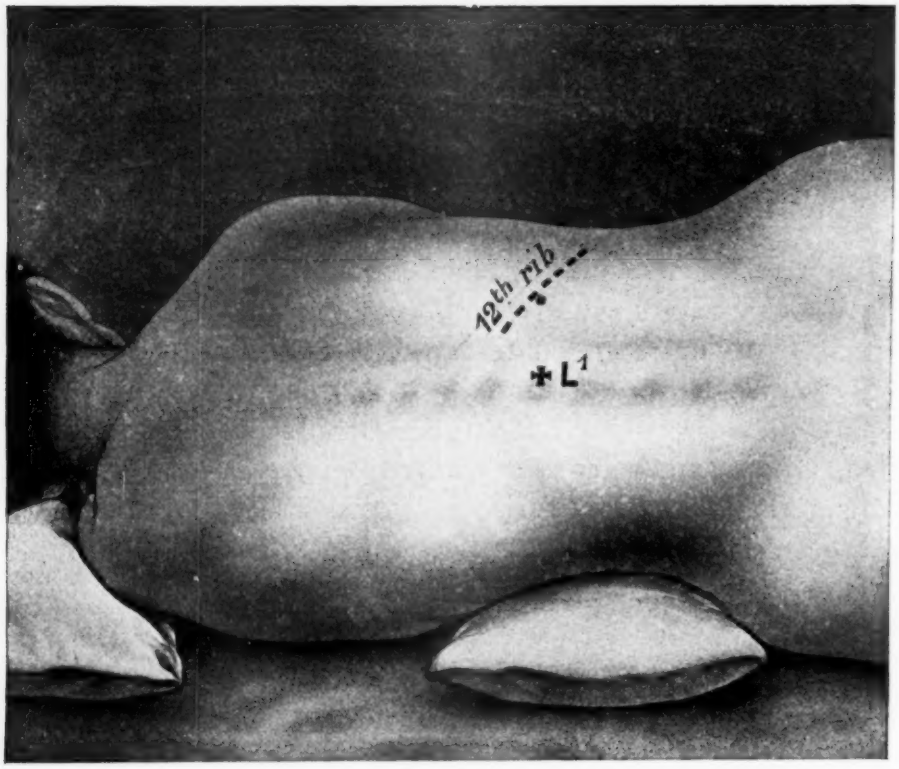


FIG. 82.

A. Splanchnic analgesia. Position of patient. The point just under the twelfth rib marks the site of puncture, and the cross, vertically under, is the spinous process of the first lumbar vertebra. The distance between the two is 4 fingerbreadths or 7 cm. (From Labat's Regional Anesthesia, Saunders.)

is theoretically not suitable to cases with mechanical or spastic obstruction, but is of use only in the paralytic or adynamic cases.

The Rupture of a Viscus

Considerable intravisceral pressure may safely be endured within an organ which has walls of normal strength. But even a much diminished pressure may later cause a rupture of this organ when its walls have become necrotic or have been injured. Thus a distended gall bladder, undergoing a reduction

in size under expectant treatment while the patient is apparently progressing satisfactorily toward a cure, may suddenly perforate and post-mortem examination reveal that the wall

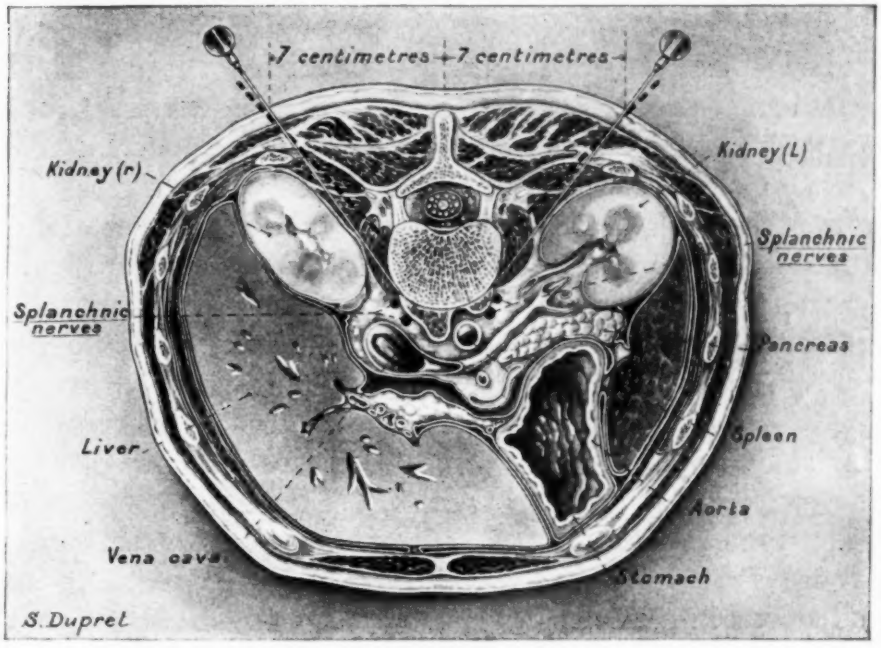


FIG. 82.

B. Cross-section through the first lumbar vertebra, showing the method of inducing splanchnic analgesia. The needle has been inserted on the lower border of the twelfth rib, 7 cm. distant from the midline of the back. The dotted line marks the direction of the needle introduced toward the spine at an angle of 45 degrees with the median plane of the body. Note its point of contact with the vertebra; the needle is here in its last and good direction: tangent to the body of the vertebra. (From Labat's Regional Anesthesia, Saunders.)

had gradually become weakened from an impacted stone or from an area of gangrene caused by infection and thrombosis. Again, it is well known that the site of an intestinal anastomosis is stronger shortly after operation than it is from three to five days later when sutures have softened and liquefaction necrosis has occurred in traumatized areas. At the time of such secondary weakness the injured area should be carefully protected from excessively high intraluminary pressures. It is preferable to gently introduce a stomach tube promptly

upon the onset of vomiting in the early postoperative period after gastroenterostomy than to allow an overfilling of weakened walls at a later period.[112] Lavage may be intermittent or continuous (see Kanavel, Bossler and Levin tubes).

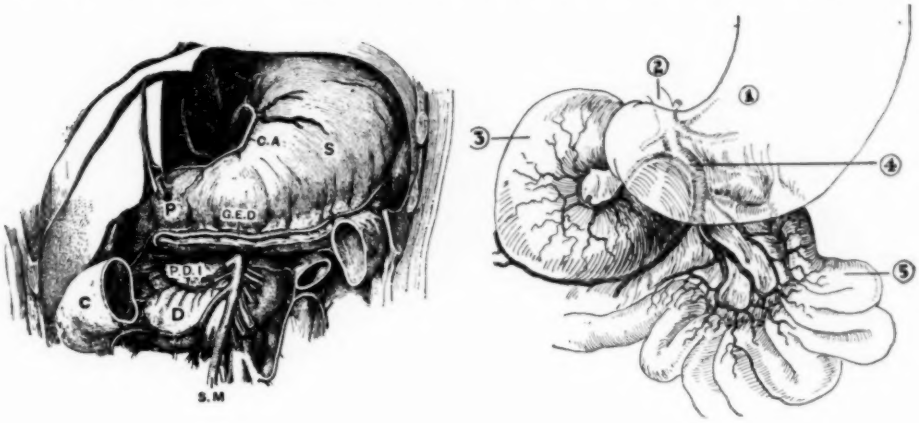
Exploring the Abdomen

At the time of operation the abdomen is often found to be filled with distended intestinal loops making it difficult to conduct a proper exploration. There seems scarcely room to crowd the examining hand into the overfilled space. Lateral retraction of the wound margins only serves to favor evisceration. Strong *upward* retraction, however, draws the anterior abdominal wall away from the distended viscera and provides ample space through which to slide the examining hand to all parts of the peritoneal cavity without causing displacement of organs or needless trauma. Such traction away from the viscera also proves of aid when the peritoneal margins are being sought and when they must be grasped by forceps without causing injury to other structures.

Gastromesenteric Ileus

An important example of an increased intraluminary pressure is the condition known as gastromesenteric (or duodenomesenteric) ileus.[113,114] Here the stomach and proximal duodenum undergo rapid and tremendous dilatation; at times the greater curvature of the stomach may within a few hours reach to the level of the pelvis, the gastric distention causing considerable displacement of movable structures within the addomen and thorax. The outstanding triad of symptoms of gastromesenteric ileus is; pain (which may become excruciating as the distention increases); repeated, effortless vomiting; and cyanosis. These are immediately and dramatically relieved by the passage of a stomach tube. They may, however, rapidly recur as the intravisceral tension again rises. Repeated lavage yields repeated relief. The condition is supposedly caused by a constriction of the terminal duodenum as it is crossed by the root of the mesentery of the jejunoileum, and particularly by compression of the duodenum against the vertebrae by the superior mesenteric artery. (Fig. 83.) Gastromesenteric ileus is a relatively frequent

complication of intra-peritoneal operations, particularly those performed within the pelvis. The condition is predisposed to by anything which causes downward traction upon the



A B

FIG. 83.

A. Position and relations of the stomach and duodenum, showing also their arterial supply. (From Testut.)

S, Stomach. P, Pylorus. D, Third part of duodenum. C, Hepatic flexure of colon (note transverse colon is cut away). C.A., Coronary artery. G.E.D., Right gastroepiploic artery running in the great omentum. S.M., Superior mesenteric artery, with its inferior pancreatico-duodenal branch (P.D.I).

B. Duodenomesenteric or gastromesenteric ileus. Showing the constriction of the last portion of the duodenum by the superior mesenteric artery.

(1) Dilated stomach. (2) Abdominal aorta. (3) Dilated duodenum. (4) Point of obstruction by superior mesenteric artery. (5) Collapsed loops of proximal jejunum distal to obstruction.

small intestines and puts tension upon the mesentery. A change in posture of the post-operative suffered, placing him face downward, tends to relieve the duodenal compression and is the surest measure for producing permanent relief. The condition, often unrecognized, is an urgent complication having a high mortality but one which, if treated early, may quite certainly and promptly be cured through a combination of postural treatment and gastric lavage.

EPONYM

FRIEDRICH TRENDELENBURG

Eponym: Trendelenburg position.

Nativity: Berlin.

Birth-Death: May 24, 1844. December 15, 1924.

Education: Earliest education was received at home (was taught English by his mother, Latin and arithmetic by his father, grammar by his aunt).

Subsequently attended a boys' school in Berlin.

In 1862 was give the option of attending a boarding school in Berlin or going to Scotland with his family for the year; chose the latter.

1863. Went from Edinburgh to Glasgow, where he studied anatomy, embryology and physics; tutored in family with whom he lived.

1863. Matriculated in University of Berlin.

1864. Took preliminary medical examinations. Studied surgery and internal medicine in clinics of von Langenbeck, Traube and Jungen.

1865. Travel study in Jena, Halle, Heidelberg and throughout central Germany.

1866. Received degree in medicine. Made military surgeon in hospital in Gorlitz.

1867. Took state examinations and wrote his thesis on Ancient Indian Surgery (De veterin Indorum chirurgia). Military surgeon at Kiel.

Connections: 1868–74. Assistant to Langenbeck.

1872. Founded German Society of Surgeons.

1874–75. Director of surgical ward, Friedrichschain Hospital, Berlin.

1875–82. Ordinarius of surgery, University of Rostock.

1882–95. Ordinarius of surgery, University of Bonn.

1895–1911. Ordinarius of surgery, University of Leipzig.

1898. Chairman, German Society of Surgeons.

1923. Historian, German Society of Surgeons.

Writings: Trendelenburg did important work with regard to plastic surgery, congenital hip joint disease, physiology of varicose veins, pulmonary embolism, gynecological and abdominal surgery.

Among his papers were the following:

Ueber Heitung der Harmblasen Ectopic durch directe Vereinegung der Spaltrander (1886).

Ueber Isobering in Chirurgischen Kliniken (1892).

Ueber Operationen zur Heilung der Angeborenen Harmblasen und Harmrohrenspalte (1892).

Zur Operation der Blasenscheiden Fisteln von der Blase Ous (1892).

Chirurgische Krankheiten der Gesichtsnerven (1908).

Source of Eponym: Ueber Blasenscheidenfisteloperationen und ueber Beckenhochlagerung bei Operationen in der Bauchhohle. (*Volkmanns*) *Samml. klini. Vortrage*, Leipzig, 1890.

Discussion of Eponym: The Trendelenburg position was first recorded by Willy Meyer in 1885. Meyer was then a student of Trendelenburg and published the description with the permission of his "venerable chief." (See photostat, Fig. 84.)

Trendelenburg himself first wrote concerning "high pelvic elevation" in 1890 (see photostat, Fig. 84).

The position was an attempt to introduce air into the open bladder following the "principle of Sims' posture (1845) where the vulva is the most elevated point of the body and the opened vagina admits the air because of negative intrapelvic pressure and thus becomes distended."

Sammlung

Klinischer Vorträge

in Verbindung mit deutschen Klinikern

herausgegeben von

Richard von Volkmann.

No. 355.

(Fünfundzwanzigstes Heft der zwölften Serie.)

Über Blasenscheidenfisteloperationen und über Beckenhochlagerung bei Operationen in der Bauchhöhle

von

Friedrich Trendelenburg.

Subskriptionspreis für eine Serie von 30 Vorträgen 15 Mark.
Preis jedes einzelnen Heftes 75 Pf.

Ausgegeben 30. Januar 1890.

Leipzig,

Druck und Verlag von Breitkopf und Härtel.

1890.

Das Recht der Übersetzung in fremde Sprachen bleibt vorbehalten.

☞ Beiträge für die »Sammlung klinischer Vorträge« werden unter der Adresse der Verlagshandlung **Breitkopf & Härtel** in **Leipzig** erbeten

355.

(Chirurgie No. 109.)

Über Blasenscheidenfisteloperationen und über Beckenhochlagerung bei Operationen in der Bauchhöhle.

Von

Friedrich Trendelenburg,

in Bonn.

Mit einer Lichtdrucktafel.

Seit ihrer Begründung durch Naegele, Dieffenbach und Jobert de Lamballe ist die Operation der Blasenscheidenfistel, besonders durch das operative Talent und die unermüdliche Ausdauer von Gustav Simon, zu einem so hohen Grad von Vollkommenheit gebracht worden, dass dieses Kapitel der gynäkologischen Chirurgie auf den ersten Blick fast vollständig abgeschlossen zu sein scheint. Neuere Vorschläge beziehen sich auf Modifikationen der Instrumente, der Lagerung und des Nahtmaterials, der Vorbereitung zur Operation und der Nachbehandlung, das Princip der Operation bleibt immer dasselbe

Meine ersten, allerdings erfolglosen Versuche in dieser Richtung (1881 u. 1884)[1] sind ziemlich unbeachtet geblieben. Nur König hat sie wiederholt[2]. Es hängt dies damit zusammen, dass auch die »Beckenhochlagerung«, welche allein das Innere der Blase so aufzuschließen vermag, dass man feinere Operationen in der Blase vornehmen kann, längere Zeit nicht die Beachtung gefunden hat, die sie meiner Überzeugung nach verdient.

Ich möchte daher das Wesen und die Vortheile dieses Verfahrens in kurzen Worten nochmals hervorheben.

Lagert man den Körper eines Kranken auf dem Operationstisch so, dass die Symphysis pubis der höchste Punkt des Rumpfes ist und die Axe des Rumpfes mit der Horizontalen einen Winkel von wenigstens 45° bildet, so sinken sämmtliche Eingeweide, vor Allem Leber, Milz und Mesenterium, durch ihre Schwere in die Höhlung des Zwerchfells hinunter. Der Darm folgt und fällt aus dem kleinen Becken heraus, so weit der Luftdruck dieses zulässt. Bei mageren Individuen und erschlafften Recti in tiefer Narkose wird die vordere Bauchwand in der Regio hypogastrica von der Beckenhöhle her förmlich angesaugt, so dass sich in dieser Gegend eine tiefe Grube bildet.

Macht man nun in der Regio hypogastrica zum Zweck des Steinschnitts einen Längs- oder Querschnitt und spaltet die Recti sowie die hinter ihnen liegende Fascie, so tritt sofort Luft in den prävesicalen Raum ein, oft mit hörbarem Geräusch, die Peritonealfalte fällt herunter, und aus dem prävesicalen Spaltraum wird ein weitklaffender Hohlraum, in den das Licht frei hineinscheint und in dem das Auge die vordere Wand der Blase und die Umschlagsfalte des Peritoneum sehen kann.

1) Willy Meyer, Über die Nachbehandlung des hohen Steinschnitts, sowie über Verwendbarkeit desselben zur Operation von Blasenscheidenfisteln. Arch. f. klin. Chir. 1885. Bd. XXXI. p. 521.

2) Verhandlungen der Deutschen Gesellsch. f. Chirurgie. XVII. 1888. p. 100.

FIG. 84A.

Friedrich Trendelenburg.

Ebenso überraschend ist der Nutzen der Beckenhochlagerung bei intraperitonealen Operationen in der Beckenhöhle und den unteren Abschnitten des Bauches.

Es handelt sich z. B. um eine Darmresektion, durch welche ein widernatürlicher After am Schenkelring (nach Brucheinklemmung) beseitigt werden soll. Die Patientin wird in Beckenhochlage gebracht. Dicht oberhalb der Fistel (die Patientin stehend gedacht) wird ein etwa 10 cm langer bogenförmiger Schnitt parallel dem Poupart'schen Bande durch die Bauchdecken gemacht, das Peritoneum wird incidirt, Luft dringt in die Peritonealhöhle ein, sämmtliche Darmschlingen rutschen nach dem Zwerchfell zu hinab. Die Wundränder werden mit Haken auseinander gezogen, und wir sehen nun in das leer gewordene kleine Becken hinein, wir übersehen die ganze Fossa iliaca, und der einzige Darmtheil, der sich präsentirt, ist die an den Schenkelring angelöthete Schlinge. Wir können das Verhalten ihrer beiden Schenkel zu einander mit dem Auge kontrolliren, können sie bequem mit dem Finger anhaken, hervorziehen, durchschneiden und vernähen, kein Inhalt fliesst aus, da, was von flüssigem Inhalt etwa noch da war, nach dem Zwerchfell zu abgeflossen ist. Wir arbeiten dabei im vollen Licht des gegenüberliegenden Fensters, wie der Maler an seiner Staffelei, ohne genöthigt zu sein, uns zu bücken und, falls die Narkose ruhig ist, ohne durch heraustretende Darmschlingen belästigt zu werden.

In gleicher Weise machen sich die Vortheile der Beckenhochlagerung bei allen gynäkologischen Operationen in der Beckenhöhle geltend und ich glaube, wer einmal einen Uterus mit Myomen oder eine verwachsene Ovarialcyste in dieser Weise exstirpirt hat, wird sich nicht leicht dazu entschliessen zu dem alten Verfahren zurückzukehren. Soweit ihre Verbindungen im kleinen Becken es gestatten, fällt die Geschwulst aus der Beckenhöhle heraus dem Operateur entgegen, alle zu trennenden Verbindungen spannen sich an, das Blut fliesst von dem Operationsfeld ab, um die Därme braucht man sich, so lange kein Erbrechen erfolgt, garnicht zu kümmern, sie bleiben bescheiden in der Magengrube liegen, vor Allem: man sieht was man macht.

Dass der Druck in dem unteren Abschnitt der Bauchhöhle bei der Hochlagerung des Beckens ein negativer wird, lässt sich an einem Manometer leicht demonstriren. Man braucht dasselbe nur durch einen Gummischlauch mit einem Katheter in Verbindung zu setzen, welcher in die Blase eingeführt ist. Bei horizontaler Lage des Körpers ergab sich bei einigen Versuchen ein Druck von + 1 cm, bei Beckenhochlagerung ein Druck von — 6 bis 8 bis — 11 cm Wasser.

In historischer Beziehung ist zu bemerken, dass die Beckenhochlagerung schon von den alten Chirurgen bei der Taxis eingeklemmter Brüche angewandt wurde, die eingeklemmte Darmschlinge sollte durch die Schwere des Mesenterium aus der Bruchpforte herausgesogen werden, durch kräftiges Schütteln des Körpers suchte man das Herausgleiten zu befördern. So empfahl Fabricius ab Aquapendente, den Kranken an Händen und Füssen aufzuhängen, den Kopf hintenüber und das Becken höher als den Thorax, und den Schwebenden tüchtig zu schütteln. Corvillard liess den Kranken an den Beinen aufhängen. Nach Sharp soll ein Gehilfe den Kranken auf den Rücken nehmen, die Unterschenkel über die Schultern ziehen, so dass die Kniekehlen des Kranken gerade auf den Schultern des Trägers ruhen. Auch dabei wurde geschüttelt. Ähnlich verfuhr Ribes[1]. Freund[2] lagerte seine Patientin bei der Exstirpation des carcinomatösen Uterus (1878) auf einem Tisch.

Ich selbst habe die Beckenhochlagerung zunächst nur bei Operationen an der Blase zu dem Zweck angewandt, um nach der Eröffnung der Blase durch hohen Steinschnitt das Innere der Blase dem Tageslicht und dem Auge zugänglich zu machen (1880). Mit der Freund'schen Mittheilung hatte die Sache nichts zu thun, es schwebte mir vielmehr das Princip der Seitenbauchlage von Sims (1845) vor, bei der bekanntlich die Vulva den höchsten Punkt des Rumpfes bildet und die geöffnete Vagina in Folge des negativen Druckes im Becken Luft aspirirt und dadurch zum Klaffen gebracht wird. In gleicher Weise wollte ich die geöffnete Blase sich mit Luft füllen lassen[1]. Erst später wurden mir die grossen Vortheile der Lagerung für die Operation des hohen Steinschnittes selbst klar[2], und dieselbe auch bei Laparotomien anzuwenden war ein weiterer sehr natürlicher Schritt. Seit 1884 operire ich bei jedem hohen Steinschnitt, seit Winter 1887/8 bei allen Laparotomien, wo es sich um Operationen in der Beckenhöhle handelt, von Anfang an nur in Beckenhochlagerung, und es ist kein Semester vergangen, wo ich meinen Zuhörern nicht die eine oder andere Operation der Art demonstrirt hatte.

Über die Technik der Beckenhochlagerung ist nicht viel zu sagen. In den ersten Jahren liess ich einen am Kopfende des Operationstisches stehenden Wärter die Knie des Patienten rückhings auf die Schultern nehmen, wie es die Alten mit ihren Bruchkranken machten, seit längerer Zeit benutze ich einen von Esch baum konstruirten besonderen Apparat, der an dem Kopfende des Operationstisches angebracht wird. Esch-baum hatte ihn auf der Kölner Naturforscherversammlung (1888 ausgestellt. — Man beginne die Operation erst, wenn die Narkose vollständig geworden ist und alles Pressen und forcirte Athmen aufgehört hat. Auch während der Operation ist darauf zu achten, dass die Narkose eine vollständige bleibt, durch die tiefe Lage des Kopfes wird sie gewöhnlich in keiner Weise ungünstig beeinflusst. Je magerer das Individuum ist und je leerer der Darm, um so mehr kommen die Vortheile der Lagerung zur Geltung.

FIG. 84B.

ARCHIV
FÜR
KLINISCHE CHIRURGIE.

HERAUSGEGEBEN
VON
DR. B. VON LANGENBECK,
Wirklichem Geh. Rath und Prof. der Chirurgie.
REDIGIRT
VON
DR. BILLROTH, Prof. der Chirurgie in Wien. und DR. GURLT, Prof. der Chirurgie in Berlin.

EINUNDDREISSIGSTER BAND.
(Mit 10 Tafeln Abbildungen und Holzschnitten.)

BERLIN, 1885.
VERLAG VON AUGUST HIRSCHWALD.
N.W. Unter den Linden No. 68.

N.Y. Academy of Medicine Library 17 West 43rd St., New York

XXIX.

Ueber die Nachbehandlung des hohen Steinschnittes sowie über Verwendbarkeit desselben zur Operation von Blasenscheidenfisteln.

Von
Dr. Willy Meyer,
I. Assistenzarzt an der chirurg. Universitätsklinik zu Bonn.

(Mit einem Holzschnitt.)

Bei der grösseren Beachtung, welche der hohe Steinschnitt in den letzten Jahren wieder gefunden, ist die Frage der Nachbehandlung vor allen eine häufig ventilirte. Primäre antiseptische Blasennaht — mit oder ohne Einlegen eines Verweilkatheters — und Occlusivverband, und Drainage der Blase durch die Bauchwunde mit offener Wundbehandlung oder folgendem Lister'schen Verbande stehen sich noch gegenüber. Auch Offenlassen der Blasenwunde ohne jede Drainage ist versucht worden.

stützen, die Patienten mit Blasentumor möglichst früh der Operation zu unterziehen, noch ehe die Kranken durch die Blutungen zu sehr geschwächt sind und ehe sich Nierenerkrankungen eingestellt haben.

Es sei hier noch der bereits kurz berührten Lagerung des Kranken gedacht, die Herr Prof. Trendelenburg seit längerer Zeit bei Operationen im Inneren der Blase in Anwendung zieht. — Wie die beigefügte Skizze des Herrn Dr. Sticker (s. die Figur) trefflich veranschaulicht, wird der Patient (nach eröffneter Blase) auf dem Operationstische vollkommen umgedreht. Der Kopf liegt tief unten, Hintertheil und Becken hoch erhoben auf dem Rande des Kopfstückes. Ein Wärter, welcher dem Operationstische den

Rücken zuwendet, hält die gespreizten und in den Knieen gebeugten Beine des Patienten auf seinen Schultern fest und sorgt so für unverrücktes Einhalten der Lage. Wie leicht begreiflich sinken jetzt die Eingeweide, der Schwere folgend, nach dem Zwerchfell zu herunter, die eröffnete Blase klafft — nach Art der Vagina bei der Sims'schen Seitenlage — und gestattet nicht nur vollkommen freien Einblick in das Innere, sondern auch, nach Auseinanderhalten der Bauch- und Blasenwundränder vermittelst breiter, stumpfer Wundhaken, am Besten wohl der grossen v. Langenbeck'schen Resectionshaken, oder nach Anziehen einer jederseits durch den Wundrand geführten Fadenschlinge, bequemste Einführung der zur Exstirpation und sonstigen Manipulationen nothwendigen Instrumente. Besonders zugänglich für Instrumente und Blick wird auf diese Weise auch die Gegend des Trigonum Lieutaudii, der häufigsten Insertionsstelle der Blasentumoren. Steht der Operationstisch, wie gewöhnlich, mit dem Fussende dem Fenster zugewandt, so fällt das Licht eben direct vom Fenster her in den unteren hinteren Abschnitt der Blase hinein und erhellt so nicht nur das Orific. int. urethr., sondern auch sehr ausgiebig die Gegend der Ureterenmündung. Man kann so Beobachtungen machen, die bei der „gewöhnlichen Rückenlage" nicht möglich sind."

FIG. 84c.

Trendelenburg was also influenced in his belief that the movable viscera might be carried out of the pelvis by the aid of gravity by his knowledge of the method employed by Fabricius of Aquapendente and others in the treatment of incarcerated inguinal and femoral hernias (hanging patients by feet or by hands and feet while the suspended body was shaken or jostled).

The position as first employed was maintained by an assistant who stood with his back to the patient, the patient's legs being flexed over his shoulders (see Fig. 84). Special supports, attached to the operating table, were later perfected and it then became unnecessary to hold the patient in the desired posture manually.

It has been written that "to have thought of high pelvic elevation (when surgical gynecology was a science still in its infancy) so that all organs drop out of the operative field, was as much of a feat as when Columbus made the egg stand on end."

Points of Interest: Trendelenburg's family dates back to 1459. His great-great-grandfather was a physician, his grandfather a lawyer, his father a professor of philosophy at the University of Berlin. Trendelenburg was the only living son in a family of eight children (six sisters and one brother who died in early youth).

He married in 1874 (Charlotte Fabricus) and was the father of six children. His family life was most happy and in later years he traveled extensively with his wife and children.

Trendelenburg's autobiography is modestly written and is a thoroughly charming document.

Special References:

Die Vorsitzenden der Deutschen Gesellschaft für chirurgie. Leipsig, Barth, 1926.
Pagel, J. Biographisches Lexikon. Berlin, Urban and Schwarzenberg, 1901.
Payr. *Munchen. med. Wchnschr.*, 72.: 568, 1925.
Trendelenburg, F. Aus Heiteren Jugentagen. Berlin, Springer, 1924.

TRANSLATION OF ARTICLE BY TRENDELENBURG

OPERATIONS FOR VESICOVAGINAL FISTULA AND HIGH PELVIC ELEVATION IN ABDOMINAL SURGERY

Since its establishment by Naegele, Dieffenbach and Jobert de Lambelle the operation for vesicovaginal fistula, particularly through the surgical genius and indefatigable energy of Gustav Simon, has been raised to such a high degree of perfection that one might well assume offhand the last word had been spoken on this subject in gynecological surgery. All later suggestions involved modification of the instruments and sutures used, posture, preoperative and postoperative treatments. Yet the fundamentals of the operation remained essentially constant. . . . . .

My first and unsuccessful attempts with this method in 1881 and 1884 (*cf.* Meyer, W., *Arcb. f. klin. Cbir.*, 31: 521, 1885) remained practically unnoticed. Konig (*Verbdl. d. Deut. Ges. f. Cbir.*, 17: 100, 1888) was the only one who tried it. One reason for this apparent neglect was that for a long time far less attention than it deserves was paid to "high pelvic elevation," which is the only method to make the interior of the bladder sufficiently accessible to permit undertaking more delicate operations inside the bladder.

Therefore I wish briefly to emphasize the character and advantages of this method.

If the patient is placed on the operating table so that the pubic symphysis is the highest point and the axis of the body forms with the horizontal an angle of at least 40 degrees, then all viscera, particularly liver, spleen and mesentery, drop by gravitation into the dome of the diaphragm. The intestines leave the small pelvis corresponding to the degree of the air pressure. In thin subjects under deep narcosis when the (abdomi-

nal) recti are slackened, the anterior abdominal wall in the hypogastric region becomes practically sucked into the pelvic cavity and forms a deep pit.

If at cystotomy the hypogastric region be longitudinally or transversely incised, separating the recti and posterior fascia, the air immediately and often audibly fills this prevesical space, the peritoneal fold drops down, the prevesical cleft opens into a wide cavity freely admitting the light and plainly exposing to view the anterior bladder wall and parietal-peritoneal fold. . . .

The advantage of high pelvic elevation is equally surprising in intraperitoneal operations of the pelvic and lower abdomen.

Take, for instance, a case of intestinal resection requiring the removal of an artificial anus at the femoral ring (after incarcerated hernia). The woman is placed in high pelvic elevation. Close above the fistula (patient imagined standing) a 10 cm. curved skin incision is made parallel to Poupart's ligament; the peritoneum is incised; the peritoneal cavity is filled with air; all intestinal loops slide down to the diaphragm. The edges of the wound are retracted with hooks. In the empty small pelvis before us we can survey the entire iliac fossa; the only presenting intestinal portion is the loop adhering to the femoral ring. We can optically control the behavior of its two legs; we can draw it forward with the finger, cut and suture it. It will not leak for whatever fluid it contained has been drained in the direction of the diaphragm. The surgeon operates in the full light of the window opposite, as the painter at the easel; he does not have to stoop, nor is he annoyed by protruding intestinal loops provided the patient is quiet during narcosis.

The advantages of high pelvic elevation become equally apparent in all gynecological operations of the pelvis. I believe no surgeon will revert to the former method who once tries hysterectomy for myoma, or extirpation of an adherent ovarian cyst in high pelvic elevation. The tumor from the pelvic cavity fairly drops into the surgeon's hands so far as adhesions in the small pelvis will let it; adhesions for separation are taut; the blood runs off the operating field; if the patient does not vomit then the intestines require no attention for they modestly retire to the pit of the stomach. Above all, the surgeon sees what he does! . . .

Manometric demonstrations readily show that in high pelvic elevation the pressure in the lower abdomen becomes negative. The manometer is connected by a rubber tube with the catheter introduced into the bladder. Tests made at horizontal posture showed plus 1 cm. pressure, at high pelvic elevation minus 6 to 8 to minus 11 cm. water pressure.

With respect to the history of high pelvic elevation we find that the method was already used by early surgeons in taxis of incarcerated hernia. The idea was to withdraw the incarcerated intestinal loop from the hernial aperture by the weight of the mesentery; by forcibly shaking the patient at the same time it was hoped to accelerate the procedure. Fabricius ab Aquapendente recommended suspending the patient by hands and feet, with the head dropped backwards and the pelvis raised higher than the thorax and in addition thorough shaking of the swinging patient. Corvillard suspended his patient by the legs. Sharp employed an attendant who supported the patient on his back in such a manner that the legs were drawn over the carrier's shoulders on which the popliteal spaces of the patient rested. The carrier also had to shake the patient. Ribas employed a similar method. Freund (*Volkmann's Sammlung klin.* No. 133) extirpated a carcinomatous uterus in 1878. . . .

Personally I first employed high pelvic elevation in bladder surgery (in 1880) for the purpose of exposing the interior of the bladder to daylight and optic inspection after opening the bladder by suprapubic cystotomy. My method is quite independent of Freund's report. I had in mind rather the principle of the Sim's posture (1845) where the vulva is the most elevated point of the body and the opened vagina admits the air

because of negative intrapelvic pressure and thus becomes distended. Similarly I intended to admit air into this opened bladder. Sometime later I realized the great advantage of the posture in suprapubic cystotomy and it was quite natural to employ it also in laparotomy. Since 1884 I have been using high pelvic elevation in every suprapubic cystotomy; since the winter of 1887–1888 I have used it in every laparotomy for intrapelvic surgery. Not a single term has passed without my demonstrating either of these operations by the above method. . . .

There is little to say on the technic of high pelvic elevation. In the beginning I stationed an attendant at the head of the operating table and suspended the patient's knees over his shoulders in much the same way the early surgeons used in hernial surgery. For some time I have now used a support especially designed by Eschbaumn and fixed to the head of the operating table. Eschbaumn exhibited it at the meeting of the Naturforscher at Cologne in 1888. The operation should be started only after narcosis is established and pressure or forced respiration has subsided. During operation deep narcosis should be maintained and it is usually not unfavorably affected by the low position of the head. The thinner the individual and the more empty the intestines the more obvious are the advantages of the posture.

TRANSLATION OF ARTICLE BY DR. WILLY MEYER REGARDING THE TRENDELENBURG POSITION

AFTER-TREATMENT IN SUPRAPUBIC CYSTOTOMY AND ITS APPLICABILITY IN THE SURGERY OF VESICOVAGINAL FISTULA

We shall briefly describe the posture of the patient which Professor Trendelenburg has employed for some time in operations of the inner aspect of the bladder. The appended sketch by Dr. Sticker (see woodcut p. 514) demonstrates that the patient (after opening of the bladder) is completely turned about. The head lies very low, the buttocks and pelvis are raised high and rest on the edge of the supporting end piece. The legs of the patient are flexed at the knees and in this position are placed respectively over the shoulders of an attendant, who turns his back to the operating table, and firmly holds the patient's legs. In consequence the intestines follow the law of gravitation and drop down in the direction of the diaphragm, the incised bladder opens—similar to the behavior of the vagina in the Sims' position—and permits not only a perfect survey of the interior of the bladder but also, after retracting the edges of the abdominal and vesical wounds with broad blunt retractors—the large von Langenbeck resection hooks are probably most suitable—or after holding back the wound edges by a loop of thread respectively, permits the introduction of all instruments required for removal or any other surgical methods. This posture especially permits a good survey of the trigonum lieutandi, the spot where vesical tumors are most frequently found inserted. If the foot end of the operating table faces the window, as is usual, the daylight directly shines into the lower posterior section of the bladder, and brings plainly into view not only the internal opening of the urethra but also the area where the ureters open. Thus observations can be made that are impossible in the "usual dorsal position."

QUESTIONNAIRE

1. Define chylous peritonitis, chyliform peritonitis, hemoperitoneum, choleperitoneum.
2. What are the chief causes of hemoperitoneum; the clinical picture?
3. What is meant by the leucocytosis following hemorrhage; by the leucocytosis of subserous hemorrhage?

A. J. S., n. s. Vol. VIII, No. 5, p. 1158

4. Describe the leucocytic reaction following bleeding beneath serous membranes; plot the typical leucocytic curve.
5. What are the signs and symptoms of bile peritonitis?
6. What are the common causes of leakage of bile into the peritoneal cavity?
7. How can chylous and chyliform ascites be differentiated?
8. What are the chief causes of chylous ascites? How may this diagnosis be established?
9. What are the clinical findings with acute perforation of a peptic ulcer?
10. What conditions predispose to an intraperitoneal extravasation of urine?
11. What is the relationship between fractures of the pelvis and injuries to the bladder?
12. Name some of the methods for making a diagnosis of intraperitoneal urinary extravasation.
13. Is the bladder a pelvic or an abdominal organ?
14. Classify the causes of ascites.
15. What is the origin of ascitic fluid?
16. What percentage of cases of ascites is due to cardiac disorders?
17. What are the most common intra-abdominal conditions causing ascites?
18. What clinical evidence points to cardiac disease as the cause of ascites; to renal disease?
19. Describe the clinical evidence of cirrhosis of the liver.
20. What are the forms of tuberculosis of the peritoneum?
21. What percentage of cases of tuberculous peritonitis shows accumulations of ascitic fluid?
22. Give the clinical evidence pointing to the diagnosis of ascites due to tuberculous peritonitis.
23. What is meant by the Virchow-Troisier gland?
24. What is the significance of an enlargement of the left supra-clavicular gland in association with ascites?
25. Describe the clinical picture in a typical case of malignant peritonitis.
26. How often is malignant peritonitis a primary condition?
27. What are the most common sites of primary malignant growths which give rise to a secondary malignant peritonitis?
28. Name the most important large veins found within the abdomen.
29. What is the significance of jaundice associated with ascites?
30. What is the most common cause of ascites in children, in adolescence?
31. When edema of the legs precedes ascites, what is the most common cause of the latter?
32. What is the most common cause of ascites when this is associated with edema of the face and upper extremities?
33. What is meant by the term "intra-abdominal pressure?" What is this pressure in terms of millimeters of mercury or centimeters of water?
34. What is the normal pressure within the abdomen? Is it atmospheric, below or above that of the atmosphere? Give proofs.
35. In what respects are the pressure conditions within the abdomen similar to those within the thorax? In what respects are they different?
36. What is the basic factor which makes possible a subatmospheric pressure within the pleural cavities? Are conditions similar in regard to the abdomen?
37. What is the derivation of the word chest and the word belly? What fundamental functional differences are implied in these derivations?
38. What precaution must be taken in applying a plaster-of-Paris jacket which covers the abdominal walls? Why?

39. What is a scaphoid abdomen?
40. What conditions cause a scaphoid abdomen? What force or forces explain the shape assumed by the abdomen in this condition?
41. What is meant by the S-shaped or Gourd-shaped abdomen? Give the most common causes of this condition.
42. By what mechanism is the general pressure within the abdomen stabilized?
43. What is the effect upon the general intra-abdominal pressure of a sudden contraction of all the muscular walls?
44. Name some of the uses of the cough reflex for diagnosis.
45. What mechanical factor sometimes leads to dyspnea in certain abdominal disorders?
46. What is a phantom tumor? What is aerophagia?
47. What is the Murphy test for acute diseases of the gall bladder? Explain the mechanism of this sign.
48. When may it be of aid to palpate the abdomen with the patient in the knee-elbow posture?
49. Discuss the technic of abdominal palpation.
50. What is meant by the enteroabdominal reflex?
51. Why does not the injection of a given amount of air or fluid into the abdominal cavity have the same effect upon intra-abdominal pressure as the injection of the same amount of the same substance into the enteral canal?
52. What is the effect upon systemic blood pressure of a rise in the general intra-abdominal pressure?
53. What are the effects upon the abdomen of the subatmospheric pressure normally present within the pleural cavity?
54. Why is the diaphragm dome-shaped?
55. Give some proof that the pleural cavities exert some upward pull upon the abdomen.
56. Explain the obliteration of liver dullness.
57. Why is shoulder pain so frequent an accompaniment of free fluid or gas within the peritoneal cavity?
58. What effects do the thoracic movements have upon the general pressure within the abdomen?
59. Explain how it is possible for the pressure within the upper part of the peritoneal cavity to be lowered during the act of inspiration.
60. What are the various types of breathing?
61. What effects do these types of breathing have upon pressure variations within the abdomen?
62. What is the effect upon the circumference of the upper abdomen of a forceful inspiration with the thoracic type of breathing?
63. In what part or parts of the abdomen is subatmospheric pressure a normal condition?
64. In what part or parts of the abdomen is a positive pressure a normal condition?
65. What conditions tend to increase the pressure negativity within the abdomen? What conditions tend to increase the intra-abdominal pressure?
66. At what phase of the respiratory cycle is it most safe to incise the upper abdominal cavity (open the peritoneum)?
67. What is meant by intraluminary pressures? Intravisceral pressures? Static pressures? Illustrate.
68. What effect has a change in intravisceral pressures upon intraperitoneal pressures?
69. By what routes are intestinal gases normally disposed of? Give the approximate percentage eliminated through each route.

70. What is the effect upon the intestinal tract of an obstruction to the intestinal lumen?
71. Name some reasons why interference with the blood supply to the bowel leads to distention of the bowel.
72. Explain why gas may accumulate within a strangulated loop of bowel.
73. Why is distention of a viscus more dangerous at one time than at another?
74. What is the effect of a sudden release of an elevated intra-abdominal pressure?
75. What precautions must be taken to prevent circulatory disturbances after the removal of a large ovarian cyst?
76. What dangers are there in suddenly emptying the bowel by means of ileostomy, when the bowel is markedly distended in the presence of an acute peritonitis?
77. What is the effect upon the bowel of blocking the splanchnic nerves by a local anesthetic agent?
78. What is a gastromesenteric ileus?
79. Give the outstanding triad of symptoms of gastromesenteric ileus?
80. What is the accepted treatment for acute gastromesenteric ileus?
81. Explain the reasons for washing the stomach and for changing the posture of the patient with mesenteric ileus.
82. After what operations is a gastromesenteric ileus most common? What is the mortality after prompt treatment; with no treatment?
83. What may be done to facilitate an exploration of the abdomen when the intestines are markedly distended with gas?

REFERENCES

82. WRIGHT, A. M. and LIVINGSTON E. M. The leucocytosis of internal hemorrhage. *N. Y. State J. Med.*, July, 1923.
83. WALLIS and SCHOLLBERG. *Quart. J. Med.* Pt. 1, 3: 301, 1910; Pt. 2, 4: 153, 1911.
84. CAMPBELL, M. F. Rupture of the bladder. *Surg., Gyn. & Obst.*, 49: 540, 1929.
85. FRENCH, H. Index of Differential Diagnosis. N. Y., Wood, 1927, p. 43.
86. CABOT. Ascites. *Am. J. M. Sci.*, 143: 1, 1912.
87. ROLLESTON, H. D. Diseases of the Peritoneum. In: Osler & McCrae, *Op. cit.*, 3: 655.
88. BARKER, L. F. Monographic Medicine. N. Y., Appleton, 1920, p. 672.
89. FRENCH, H. *Op. cit.*, p. 50–55: Ascites, Causes of.
90. JOHNSON, A. B. Abdominal Diseases; Surgical Diagnosis. Ed. 2. N. Y., Appleton, 1911. 2: 2–15.
91. WAGONER, G. W. Studies of intra-abdominal pressure. *Am. J. M. Sc.*, 1916.
92. COFFEY, R. C. Intravisceral and intra-abdominal pressure. *J. A. M. A.*, 69: 683, 1917.
93. KELLING, G. Untersuchungen über die Spannungszustande der Bauchwand der Magen-und der Darmeand. *Ztschr. f. biol.*, 44: 161, 1903.
94. WRIGHT, SAMSON and VINCENT, S. Applied Physiology. Ed. 2. London, Oxford, Humphrey Milford, 1928, p. 313.
95. SAYRE, R. H. Diseases and Injuries of the Spine. In: Sajous' Analytic Cyclopedia of Practical Medicine. Phila., Davis, 1917, 8: p. 271.
96. CROSSEN, H. S. Operative Gynaecology. Ed. 2, St. Louis, Mosby, 1920, p. 403.
97. WANGENSTEIN and SCOTT. Collapse after sudden decompression of distended abdomen. *Arch. Surg.*, 16: 144, 1928.
98. DELEE, G. B. Principles and Practice of Obstetrics. Ed. 3, Phila., Saunders. 1920, p. 155.

99. McBURNEY, C. Discussion on appendicitis; indications for early laparotomy. *Tr. M. Soc. N. Y.*, p. 211, 1891.
100. MURPHY, J. B. The Surgery of the Vermiform Appendix. In: Keen's Surgery. Phila., Saunders, 1913, 6: 549.
101. BAILEY, H. Demonstration of Physical Signs in Clinical Surgery. N. Y., Wood, 1927, p. 104.
102. FRENCH, H. Differential Diagnosis. Ed. 3, N. Y. Wood, 1929, p. 45.
103. TODD, T. W. The Clinical Anatomy of the Gastrointestinal Tract. N. Y., Longmans Green, 1915, p. 11.
104. KELLING, G. Untersuchungen über die Spannungszustande der Bauchwand der Magen-und der Darmeand. *Ztscbr. f. biol.*, 44: 161, 1903.
105. REIMANN, S. Rost's Pathological Physiology of Surgical Diseases. Phila., Blakiston, 1923, p. 182.
106. LEFTWICH, R. W. Index of Symptoms. Ed. 6, N. Y., Wood, 1917, p. 465. See also STEDMAN. Medical Dictionary, Ed. 8, N. Y., Wood, 1924.
107. COPE, Z. The Early Diagnosis of the Acute Abdomen. Ed. 3. London, Oxford, Humphrey Milford, 1926, p. 95.
108. BINNIE, J. F. Operative Surgery. Ed. 7, Phila., Blakiston, 1916, p. 341.
109. ROST. Pathological Physiology of Surgical Diseases. Phila., Blakiston, 1923, p. 213.
110. STENGEL, A. Diseases of the Intestines. In: Osler's Modern Medicine. Ed. 2, Phila., Lea, 13: 1914, 436.
111. OCHSNER, GAGE and CUTTING. Treatment of ileus by splanchnic anaesthesia. *J. A. M. A.*, p. 1847, 1928.
112. BARTLETT, W. The After Treatment of Surgical Patients. St. Louis, Mosby, 1920, 2: 793. See also KANAVEL. *Surg. Gyn. Obst.*, 1916.
113. CONDON, A. P. Gastromesenteric ileus. AM. J. SURG., p. 107, 1919.
114. MOYNIHAN, SIR B. Abdominal Operations. Ed. 4, Phila., Saunders, 1926.

THIS MONTH'S CONTRIBUTORS

ASCHNER, PAUL W., M.D., F.A.C.S., N. Y.
Adj. Surg. & Assoc. Surg. Path., Mt. Sinai Hosp.; Sen. Attend. Urol., Brownsville & East Side Hosp.

BICK, EDGAR M., M.D., N. Y.
Staff, Hosp. for Joint Diseases.

BIDGOOD, CHARLES Y., M.D., Hartford, Conn.
Clin. Assist. Urol., Yale Univ., Attend. Urol., Meriden Hosp., Meriden; Manchester Mem. Hosp.

BUCHMAN, JOSEPH, M.D., F.A.C.S., Bklyn., N. Y.
Assoc. Orth. Surg., Hosp. for Joint Dis. & United Israel Zion Hosp.; Chief of Clin., United Israel Zion Hosp.; Assist. Surg., Hosp. for Ruptured & Crippled.

BUTLER, P. F., M.D., Boston.
Instruc., Harvard Med. School; Radiol., City Hosp.

CASE, JAMES T., M.D., F.A.C.S., Chicago, Ill.
Prof. Roentgenol., Northwestern Univ. Med. Coll.; Surg., Battle Creek Sanit.; Roentgenol., Passavant Hosp.; Editor, Annals of Roentgenology.

COLER, BIRD S., N. Y.
Former Commissioner Public Welfare.

COLLENS, WILLIAM S., M.D., Bklyn.
Instruc. Pediat., Long Island Med. Coll.; Direc. Metabol., Crown Heights Hosp.

CRABTREE, ERNEST GRANVILLE, M.D., F.A.C.S., Boston.
Instruc. Surg., Harvard Grad. School of Med.; Urol., Beth Israel and Boston Lying-in Hosp.; Cons. Urol., Henry Heywood Mem. Hosp., Gardner, Sturdy Mem. Hosp.; Attleboro, Newton, Norwood & Milford Hosp.

DEALY, FRANK N., M.D., F.A.C.S., N. Y.
Visit. Surg., St. Vincent's Hosp.; Attend. Surg., Mary Immaculate Hosp., Jamaica.

DEAN, ARCHIE L., M.D., N. Y.
Assoc. Attend. Surg., Memorial Hosp.; Assoc. Attend. Urol., Fifth Avenue Hosp.; Visit. Urol., Reconstruction Hosp.; Cons. Urol., Somerset Hosp., Somerset, N. J.

DOUB, HOWARD P., M.D., Detroit, Mich.
Roentgenol., Henry Ford Hosp.

DOUGHERTY, JOSEPH F., M.D., Upper Darby, Pa.
Assist. Surg., Misericordia Hosp., Phila.

FOSTER, GEORGES S., M.D., Manchester, N. H.
Staff, Lucy Hastings Hosp.

FOX, CHARLES M., M.D., San Diego, Calif.

GOLDZIEHER, MAX A., M.D., Bklyn.
Pathol., Crown Heights & Israel Zion Hosp.

GOLOB, MEYER, PH.G., M.D., N. Y.
Instruc. & Lect., Gastroenterology, N. Y. Homeopathic Coll. & Flower Hosp.

GRAHAM, HENRY F., M D, F.A.C.S., Bklyn.
Sen. Surg., Methodist Hosp.

GREEN, CHARLES C., M.D., F.A.C.S., Houston, Tex.
Chief Surg., S. Pacific Lines in Texas & Louisiana; Surg. Staff, Methodist, Baptist & Hermann Hosp.; Visit. Surg., St. Joseph's Inf., & Municipal Hosp.

GREENHILL, J. P., M.D., F.A.C.S., Chicago.
Assoc. Obstet., Northwestern Univ. Med. School; Attend. Obstet., Chicago Lying-in Hosp. & Disp.; Attend. Gynec., Cook County Hosp.; Co-author: "Year Book of Obstetrics," 1923–1929.

HUEPER, W. C., M.D., Phila.
Chief Pathol., Cancer Research, Univ. Penna., Phila.

HUBENY, M. J., M.D., Chicago, Ill.
Editor: *Radiology*.

HUNTER, GEORGE, H. V., M.D., F.A.C.S., Bklyn.
Attend. Orth. Surg., Norwegian Hosp.; Assoc. Orth. Surg., Brooklyn Hosp.

JACKSON, BYRON H., M.D., F.A.C.R, Scranton, Pa.

KENNEDY, DONALD G., F.R.G.S., Vaitupu, Ellice Islands, South Seas.
Colonial Serv., Educ. Dept., Brit. Protect. Ellice Islands.

KOSTER, HARRY, M.D., F.A.C.S., N. Y.
Attend. Surg., Crown Heights Hosp.

LIVINGSTON, EDWARD M., M.D., N. Y.
Instruc. Surg., N. Y. Univ. & Bellevue Med. Coll.; Assist. Visti. Surg., Bellevue Hosp.; Co-author: "Text-book of Minor Surgery" Ed. 5, D Appleton & Co, 1929.

MARTIN, HENRY S., M.D., F.A.C.S., Warsaw, N. Y.
Surg., Wyoming County Community Hosp.

MAYER, LEO, M.D., N. Y.
Assoc. Prof., Post-Graduate Med. School; Attend. Orth. Surg. Post-Graduate Hosp.; Cons. Orth. Surg., Rockaway Beach, St. Joseph's & Long Beach Hosp.

MCGEE, ANDREW R., M.B., M.D., Detroit.
Dept. Roentgenol., Henry Ford Hosp.

MORA, JACOB M., M.D., Chicago.
Instru. Surg., Univ. of Ill. Med. Coll.; Assoc. Surg., Mt. Sinai Hosp.

MORTON, CHARLES BRUCE, M.D., University, Va.
Assist. Prof. Surg. & Gynec., Univ. Va.

NEILL, WILLIAM, JR., M.D., F.A.C.S., Baltimore.
Surg., Howard A. Kelly Hosp.; Visit. Surg., Church Home & Inf. & Hosp. for Women of Maryland; Cons. Surg., Cambridge Mem. Hosp., Cambridge.

PELOUZE, P. S., M.D., Phila.
Assoc. In Urol. & Assist. G. U. Surg., Univ. of Penna.; Author: "Gonorrhea in the Male," W. B. Saunders & Co.

RITTER, J. SYDNEY, PH.C., M.D., F.A.C.S., N. Y.
Assoc. Dept. Urol., N. Y. Post-Grad. Med. School; Chief, Urol. Clin., N. Y. Post-Grad. Hosp.; Attend. Urol., Midtown & Long Beach Hosp.

RUDDOCK, JOHN C., M.D., Los Angeles.
St. Vincent's Hosp.

SANTE, L. R., M.D., F.A.C.P., F.A.C.R., St. Louis.
Prof. Radiol. & Dir. Dept., St. Louis Univ. Med. School; Radiol., Univ. Group, St. Mary's Hosp. & Inf.; Chief Radiol., City Hosp.; Cons. Radiol., Koch Hosp. for Tub.

STANTON, E. MACD., M.D., F.A.C.S., Schenectady, N. Y.
Surgeon, Ellis Hospital.

TOLAND, C. G., M.D., Los Angeles.
St. Vincent's Hosp.

ULLMANN, H. J., M.D., Santa Barbara, Calif.
Radiol., Cottage Hosp.

WATSON, LEIGH F., M.D., Los Angeles.
Adj. Attend. Surg., California Hosp.; Author "Hernia," C. V. Mosby Company, 1924.

WHITE, RICHARD J., M.D., Fort Worth, Tex.
W. I. Cook Mem. Hosp.

WHITTEMORE, CLARENCE B., M.D., F.A.C.S., Johnson City, N. Y.
Instruc. Surg., School of Nursing, Wilson Mem. Hosp.; Chief of Staff, Wilson Mem. Hosp.; Chief Surg., Endicott Johnson Med. Service; Ideal Hosp., Endicott.

WILLIS, DAVID A., M.D., Chicago.

Instruc. Surg., Univ. of Illinois Coll. of Med.; Assoc. in Surg., Mt. Sinai Hosp., Chicago.

WILMOTH, CLIFFORD LEE, M.D., F.A.C.S., D. TROP. MED. & HYG., Baltimore.
U. S. Pub. Health Serv.

WOLLNER, ANTHONY, M.D., N. Y.
Instruc. Gynec., N. Y. Post-Grad. Med. School & Hosp.; Assoc. Gynec. & Obstet., Sydenham Hosp.

ZWEIBEL, LEONARD, M.D., Newark, N. J.
Instruc. in Anat. & Physiol., School of Nursing, Wilson Mem. Hosp.; Res. Physic., Wilson Mem. Hosp., Johnson City, N. Y.